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Proceedings and transactions of the Scientific Association

Meriden Scientific Association

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Received

TRANSACTIONS

OF THE

MERIDEN SCIENTIFIC ASSOCIATION

MERIDEN, CONN.

VOL. IV

1889–1890.

CONTENTS OF VOLUME I.

—OF THE—

TRANSACTIONS OF THE MERIDEN SCIENTIFIC ASSOCIATION.

Catalogue of the Phænogamous and Vascular Cryptogamous Plants found in Meriden, Conn. By Emily J. Leonard.

CONTENTS OF VOLUME II.

The Catopterns gracilis, by Chas. H. S. Davis, M. D.
The Hanging Hills, by Rev. J. H. Chapin, Ph. D.
An Interesting Find, by Rev. J. H. Chapin, Ph. D.
A List of the Birds of Meriden, by Franklin Platt.
Additional Plants found growing in Meriden, by Mrs. E. B. Kendrick.
West Peak, and What It Saith, by Rev. J. T. Pettee.

CONTENTS OF VOLUME III.

The Ash Bed at Meriden, and its structural Relations, by William Morris Davis.
The Nidus of Lunatia-heros, by Frank J. Seidensticker.
The Trap Ridges of Meriden Again, by Rev. J. H. Chapin, Ph. D.
Some Notes on Africa, by Rev. J. H. Chapin. Ph. D.
The Horizontal Moon, by Rev. J. T. Pettee.
A Supplementary List of the Birds of Meriden, Conn., by Franklin Platt.
A List of the Butterflies of Meriden, Conn., by Franklin Platt.
A List of the Forest Trees and Shrubs to be found in Meriden, Conn., by Chas. H. S. Davis.

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OF THE

Peabody Museum of American Archæology and Ethnology

IN CONNECTION WITH HARVARD UNIVERSITY

PRESENTED BY

The Association

Received Sept. 1891.

J. G. PERCIVAL.

3

Anal.

PROCEEDINGS AND TRANSACTIONS

OF THE

SCIENTIFIC ASSOCIATION,

MERIDEN, CONN.

1889-1890.

VOL. IV.

MERIDEN, CONN.
PRESS OF E. A. HORTON & CO.,
1891.

L. Soc. 120. Cn. 5
Gift of the Association
Rec. Feb, 1891

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OFFICERS.

Rev. J. H. Chapin, Ph. D.	President.
Rev. J. T. Pettee, A. M.	Vice-President.
Chas. H. S. Davis, M. D.	Secretary.
G. H. Wilson, M. D.	Treasurer.
Robert Bowman,	Curator and Librarian.
George L. Cooper, Miss Alice H. Derby,	Auditors.
Mrs. Ella B. Kendrick,	Collector.

DIRECTORS OF SECTIONS.

Geology and Palæontology,	Rev. J. H. Chapin, Ph. D.
Astronomy,	Rev. J. T. Pettee, A. M.
Archæology and Ethnology,	C. H. S. Davis, M. D.
Anthropology,	Sarah I. Shaw, A. B.
Chemistry and Biology,	Caroline J. Hitchcock.
Microscopy,	G. H. Wilson, M. D.
Botany,	Mrs. Ella B. Kendrick.
Zoology,	Rev. I. R. Wheelock, A. M.
Geography,	S. T. Frost, A. M.
Mechanics and Technology,	George L. Cooper.
Necrology,	Mrs. A. A. French.

PUBLISHING COMMITTEE.

CHAS. H. S. DAVIS, M. D.   S. T. FROST, A. M.

MRS. E. B. KENDRICK.

Report of Secretary.

At the beginning of the tenth year of the existence of the Meriden Scientific Association, we have on our books the names of one hundred and ten members.

During 1889, three honorary and six active members, and in 1890, five active members were elected.

Regular meetings were held on the second Monday evening of each month, with the exception of July and August.

Notwithstanding the large membership which our books show, there are many members who do not attend the meetings, and quite a number who have not paid their annual dues.

The small attendance at some of our meetings, may be accounted for, owing to the migratory character of the Association. Owing to repairs on the City Hall, and the use of the rooms at times by the Common Council, the Association has been obliged to meet in the parlors of the Universalist Church, Y. M. C. A. building, the City Mission building, and at the High School. In the mean time the valuable cabinets and library of the Association have been placed in the High School.

It is to be hoped that before long the Association will have suitable permanent rooms, where the hundreds of publications received can be more accessible to the members; then we hope to witness a return of the vitality and enthusiasm which has in previous years characterized the Association.

The Association receives regularly the transactions and reports of some one hundred and fifty Scientific Societies and Institutions, and donations from the Smithsonian Institution and the Department of the Interior.

Report of Secretary.

At the meeting of the Directors of Sections, new and important facts coming under the observation of the members have been presented, and at the alternate meetings the following papers have been read.

Triassic Formation of the Connecticut Valley,	S. W. Loper.
Onamatology. The Origin and Derivation of name,	S. T. Frost.
Glaciers of the United States,	Rev. I. R. Wheelock.
Volvox and Water Impurities,	Dr. G. H. Wilson.
Sound,	Dr. G. H. Wilson.
The Stone Age of Connecticut,	James Shepard.
Geology of Northern Africa,	Dr. J. H. Chapin.
Social and Home Life in Germany,	Dr. E. C. Newport.

CHAS. H. S. DAVIS,
Secretary.

Report of Treasurer.

1889.

DR.

Jan.	1,	To Balance,	$234.61	
“	21,	“ Cash,	10.00	
“	23,	“ Interest on Loans,	2.22	
Aug.	27,	“ Cash,	26.00	
Nov.	27,	“ Cash,	1.00	

1890.

Jan.	11,	To Cash,	18.00	
Dec.	5,	“ Cash,	30.00	
				$321.83

1889.

CR.

Jan.	23,	By Cash	Paid	E. B. Kendrick,	$6.50	
“	“	“	“	G. M. Dayton,	6.50	
“	“	“	“	L. M. Hubbard,	1.00	
Apr.	13,	“	“	C. H. S. Davis,	6.75	
“	5,	“	“	E. A. Horton & Co.,	141.25	
May	14,	“	“	G. M. Dayton,	30.00	
Aug.	16,	“	“	G. M. Goodwill,	1.50	
Sept.	10,	“	“	E. M. Judd,	4.00	

1890.

Jan.	14,	“	“	E. A. Horton & Co.,	2.00	
Mch.	31,	“	“	E. Rossbach,	2.25	
Apr.	15,	“	“	E. A. Horton & Co.,	3 00	
“	16,	“	“	H. T. Smith,	4.00	
May	9,	“	“	Manning, Bowman & Co.,	1.60	
Dec.	5,	“	“	E. B. Kendrick,	4.90	
						$215.25

Dec.	31,	Balance on hand,	$106.58

G. H. WILSON, M. D.,

Treasurer.

January 1, 1891.

Report of Curator and Librarian.

The following have been received by exchange or presentation since our last report.

Report of Johns Hopkins University, 1889-1890.

Report of Central Park Menagerie, 1888-1889-1890.

Report of the Shell Fish Commissioners of Connecticut, 1889.

Report of the Fish Commissioners of Connecticut, 1889.

Report of the Bureau of Statistics of New Jersey, 1888-1889-1890.

Report of U. S. Chief of Ordnance, 1887-1888.

Report of Chief Signal Office, 1887-1888.

Report of U. S. Geological Survey, 1885-1886.

Report of Smithsonian Institution, 10 vols.

Report of Royal Cornwall Polytechnic Society, Falmouth, 1888.

Report of the New Haven Public Schools, 1888-89 90.

Report of American Museum of Natural History, Central Park, 1889-1890.

Report of Zoological Society of Philadelphia, 1889.

Report of Canadian Institute, 1889-1890.

Report of the Botanical Work in Minnesota in 1886. J. C. Arthur.

Report of the Board of Education of Connecticut, 1888-89-90.

Report of Board of Agriculture of Connecticut, 1888-1889.

Report and Proceedings of Belfast Naturalist Field Club, 1887-1888.

Report of Curators of Museum, Wesleyan University, 1890.

Report of U. S. Bureau of Ethnology, 1888-1889.

Report of State Mineralogist of California, 1889.

Bulletin of Torrey Botanical Club, 1888-89-90.

Bulletin of Minnesota Academy of Natural Sciences, Vol. III.

Bulletin of Scientific Association, Peoria, Ill., 1887.

Bulletin of Essex Institute, 1888-1889.

Bulletin of American Geographical Society, 1889-1890.

Bulletin of Washburn Laboratory of Natural History, Topeka, 1884-85-86.

Bulletin of American Museum of Natural History, New York, 1889.

Transactions of Academy of Science, St. Louis, 1886-1888.

Transactions of Anthropological Society, 1879 to 1885.

Transactions of the Wagner Free Institute of Science, Vol. I, 1887.

Transactions of Geological Society of Glasgow, 1883 to 1889.

Transactions of Academy of Sciences of New York, 1888-1889.

Transactions of Royal Society of Cornwall, Penzance, 1889.

Transactions of Academy of Sciences, Kansas, Vol. X, XI.

Proceedings and Transactions of Natural History Society of Glasgow, 1887-88, 1888-89.

Proceedings of Colorado Scientific Society, 1885-86-87.

Proceedings of Natural Science Association of Staten Island, 1883 to 1890.

Proceedings of Canadian Institute, Toronto, 1887-88-89-90.

Proceedings of Davenport Academy of Sciences, 1884 to 1889.

Proceedings of Natural History Society of Wisconsin, 1885-86-87-88-89.

Proceedings of California Academy of Sciences, 1889.

Proceedings and Transactions of Royal Dublin Society, 1888-89.

Proceedings of Folkestone Natural History Society, 1886-87-88-89.

Proceedings and Transactions of Nova Scotia Institute of Natural Science, Vol. III.

Proceedings of Belfast Natural History and Philosophical Society, 1888-1889.

Abstract of Proceedings of the Geological Society of London, 1889-1890.

Memoir and Proceedings of Manchester Literary and Philosophical Society, 1888-1889.

Journal of Elisha Mitchell Scientific Society, 1888-89.

Journal of Comparative Medicine, 1889.

Journal of Liverpool Polytechnic Society, 1888.

Journal of New York Microscopical Society, Vol. VI.

Journal of Royal Institute of Cornwall, Texas, 1889-1890.

Journal of Cincinnati Society of Natural History, 1890.

The Academy of Sciences of St. Louis, 1890.

Colorado College Studies, 1890.

Scientific Work of the Johns Hopkins University.

Johns Hopkins University Circular, 1889-90.

History and Work of Warner Observatory, 1883-86.

Geological and Natural History Survey of Minnesota, St. Paul, 1886-1887.

Preliminary Description of the Peridotytes, Gabbros, Diabases, and Androsites of Minnesota. M. E. Wadsworth, St. Paul, 1887.

Synopsis of the Aphidida of Minnesota. O. W. Oestlund, St. Paul, 1887.

The Study of History in American Colleges and Universities. H. B. Adams, 1887.

American Ephemeris and Nautical Almanac, 1892.

Natural Gas in Minnesota. N. H. Winchell.

History of Geological Surveys of Minnesota. N. H. Winchell.

List of Members of the Geological Society of London, 1889.

Land Birds of the Pacific District. Lyman Belding, San Francisco, 1890.

A Revision of the South American Nematognathi. C. H. and Rosa S. Eigenmann, San Francisco, 1890.

Catalogue of Amherst College, 1889-1890.

Catalogue of Brown University, 1888-1889.

The Charter of Brown University.

Catalogue Universitatis Brunensis, 1886.

Frontenac and Miles Standish in the Northwest. E. S. Isham, N. Y., 1889.

The Sciences and the Arts of the XIX Century. J. M. Gregory, 1882.

The Ethical Functions of Scientific Study. T. C. Chamberlain, N. Y., 1888.

Proper Homes and How to Have Them. R. T. Short.

Meteorological Observations taken at Davos-Platz, Switzerland, 1887-1888.

The Van de Poels System of Electric Lighting, Chicago, 1887.

Safe Dynamo Electric Currents, London, 1888.

Catalogue of Brush Electric Company.

Catalogue of Daft Electric Company.

Meisler System of Incandescent Lighting, 1889.

Catalogue of Physical Instruments, Chemical Apparatus, etc. J. W. Queen, Philadelphia, 1888.

Permeability of Cements. M. M. Claye and Debray, Philadelphia, 1889.

The Debt of Medical and Sanitary Science to Synthetic Chemistry. S. P. Sadtler, Philadelphia, 1889.

Industrial Applications of Cotton Seed Oil. R. Grimshaw, Philadelphia, 1888.

Some American Contributions to Meteorology. W. M. Davis, Philadelphia, 1889.

Food Products. Twelve Edible Mushrooms. Thos. Taylor, M. D., Washington, 1889.

Mitrometrical Measurements of Double Stars, 1875-1876. Cincinnati Observatory, 1877.

The Faults in the Triassic Formation near Meriden, Conn. W. M. Davis, Cambridge, 1889.

Topographical Development of the Triassic Formation of the Connecticut Valley. W. M. Davis.

The Earth and its Evidences, 1888.

The Ice Age of North America. Syllabus of Lectures by G. F. Wright.

Bibliography of the Iroquoian Language. J. C. Pilling.

Bibliography of the Musktrogean Language. J. C. Pilling.

Textile Fabrics of Ancient Peru. W. H. Holmes.

Circular, Square, and Octagonal Earthworks of Ohio. Cyrus Thomas.

The Problem of the Ohio Mounds. Cyrus Thomas.

The Interior and Exterior Triassic Trap Sheets of the Connecticut Valley. W. M. Davis and Chas L. Whittle, Cambridge.

West American Scientist, 1888-1889.

Ornithologist and Oologist, 1889,1890.

The Nautilus, 1889.

The Locomotive, 1889-1890.

The Polytechnic, 1889.

American Journal of Photography, 1889.

The Naturalist, 1889.

Memorial of Emily J. Leonard, by Georgia Louise Leonard. (From the Author).

Annual Report of Bureau of Ethnology, 1883-86. From Smithsonian Institute.

United States Geological Survey, 1886-1887.

First Book in Geology. N. S. Shaler, 1887.

The following books have been purchased by the Association.

The Ice Age of North America. C. F. Wright.

Butterflies of New England. C. J. Maynard.

The Riverside Natural History. Edited by John Sterling Kingsley, 4 Vols.

Key to North American Birds. Elliot Coues.

Practical Biology. Huxley and Martin.
Animal Mechanism. E. J. Mary.
The Forms of Water. John Tyndall.
Five Senses of Man. Julius Bernstein.
Manual of the Vertebrate. D. S. Jordan.
Man and Nature. G. P. Marsh.
Zoology. A. S. Packard.
American Entomology. Thomas Say. 2 Vols.

FOREIGN EXCHANGES.

Memoire Della R. Accademia Dell Scienze Dell' Instituto di Bologna, 1889.

Bulletino Mensile della Academia Gioenia di Scienze Naturali, Catania, 1889-1890.

Atti e Rendiconti della Academia Medico-Chirurgica di Perugia, 1889-1890.

Atti della Societa Toscana di Scienze Naturali, 1889-1890.

Alla Memoria del Prof. Giuseppe Meneghini. Pisa, 1889.

Programma del Regio Istituto Tecnico Superiore di Milano, 1889-1890.

Annali del R. Instituto Tecnico Antonio Zanon in Udine, 1889.

Sitzungsberichte der Naturforschenden Gesellschaft zu Leipsig, 1886-1887.

Verhandlungen der Naturhistorischen Vereines der Preussischen Rheinlande, etc. Bonn, 1889-1890.

Programm der Technischen Staatslehranstalten zu Chemnitz. Osteen, 1889.

Jahresbericht der Naturforschenden Gessellschaft in Emden, 1886-88-89.

Fuhrer durch das Kgl. Mineralogisch-Geologische und Prachistorische Museum zu Dresden, 1887.

Abhandlungen Herausgegben vom Naturwissenschaftlichen Vereins zu Bremen, 1889-1890.

Monatliche Mittheilungen Gesammtgebiete Naturwissenschaften. Frankfort, 1888-1889.

Annalen des K. K. Naturhistorischen Hofmuseum. Wien, 1886-87-88.

Jahresbericht der Geographischen Gessellschaft zu Greifswald, 1883-1889.

Vierundzwanzigster Bericht der Oberhessischen Gesellschaft fur Natur-und Heilkunde. Giefsen, 1886-87-88-89.

Verhandlungen der Naturforschenden Gesellschaft in Basel, 1886-1889.

Jahresbericht der Vereins fur Naturwissenschaft zu Braunschweig, 1886-1887.

Korrespondenzblatt des Naturforscher Vereins zu Riga, XXXII, 1889.

Jahresbericht der Technischen Staatslehranstalten zu Chemnitz. Ostern, 1890.

Jahresbericht der Naturhistorischen Gesellschaft zu Hanover, 1887-1889.

Anzeiger der Kaiserlichen Akademie der Wissenschaften, XXVI, Jahr, 1889.

Fetschrift zur Feier des Funfundzwanzigjahrigen Bestchens des Naturwissenschaftlichen Vereins zu Bremen, 1889.

Bericht Oberhessischen Gessellschaft fur Natur-und Heilkunde, Giefsen, 1890.

Verhandlungen des Botanischen Vereins der Provinz Brandenburg. Berlin, 1888-1889.

Register Uber die Verhandlungen des Botanischen Vereins der Provinz Brandenburg. Band 1, XXX, 1859-1888.

Annales Societe Linnernnee de Lyon, 1885-1887.

Questionnaire de Sociologie et d'Ethnographie. Paris, 1889.

Bulletin de la Societe Zoologique de France. Paris, 1888 89-90.

Bulletin de la Societe. Vaudoise des Sciences Naturalles, Lausanne, 1888-1889.

Bulletin Societe Entomologique de France, 1889-1890.

Bulletin des Seances de la Societe Entomologique de France, 1889.

Bulletin de l'Institut National Genevois. Tome, XXIX, 1889.

Les Premieres Ages du Metal dans le Sud-Est de l'Espagne.

Memoires de l'Institut National Genevois, 1886-1889. H. & L. Siret. Bruxelles, 1888.

Lois, Statuts et Reglements concernant les Anciennes Academies et l'Institut, de 1635 a 1889. Paris, 1889.

Societe Botanique de Lyon. Bulletin Trimestrial, 1889.

Congres International des Sciences Ethnographiques. Paris, 1889.

Societatum Litterae, 1889. Frankfort.

Acta Societatis Pro Fauna et Flora Fennica, 1887-1888. Helsingfors.

Meddelanden af Societatis Pro Fauna et Flora Fennica, 1888-1889. Helsingfors.

Notae Conspectus Florae Fennicae Auctore Hjalmar Hjelt. Helsingfors, 1888.

Herbarium Musei Fennici, 1, Plantae Vasculares. Helsingfors, 1889.

Archives Musee Teyler. 1881-1890. Harlem.

Fondation Teyler. Catalogue de la Bibliotheque. 1885-90. Harlem.

Communicacoes da Commissao dos Trabalhos Geologicos de Portugal. Lisbon, 1885-89.

La Naturaleza, Periodico Cientifico de la Sociedad Mexicana de Historia Natural. Mexico, 1890.

Liste Systematique des Publications de l'Institut Royal Geologique de Suede. Stockholm, 1890.

Bihag till Kongl. Svenska Vetenskaps-Akademiens Handlingar. Stockholm, 1886-87.

Entomologisk Tidskrift, 1889. Stockholm.

Praktiskt Geologiska Undersokningar inom Jemtlends Lan. Stockholm, 1885-89.

Om Lias I Sydostra Skane. af Joh. Chr. Moberg. Stockholm, 1888.

Sveriges Geologiska Undersokning. Ser. C. Nos. 93-115.

Om Granitindustrien I Utlandet Sarskildt Storbritannien. H. Lundbohm. Stockholm, 1889.

Om Apatitens Forekomstaatt I Norrbottens Lan. af G. Lofstrand. Stockholm, 1890.

Collection of Indian Pottery, presented by Rev. J. H. Chapin, Ph. D.

This collection of Indian Pottery consists of Idols, Bowls, Pitchers, Cups, Jugs, Tea Pots, Water Coolers and Effigies, selected from nineteen different Pueblos or Indian Tombs in New Mexico and Arizona.

ABSTRACT OF MINUTES

OF THE

MERIDEN SCIENTIFIC ASSOCIATION,

For the Years, 1889-1890.

Ninety-first Regular Meeting, JANUARY 14, 1889.

Rev. Geo. W. Griffith was proposed for membership.

Bills ordered paid of G. M. Dayton for $6.50 and Mrs. E. B. Kendrick for $6.50.

Prof. Wm. H. Davis, of Harvard University, and Prof. Wm. North Rice, of Wesleyan University, were elected honorary members.

The following officers were elected for the ensuing year:

President, REV. J. H. CHAPIN.
Vice-President, REV. J. T. PETTEE.
Secretary, DR. CHAS. H. S. DAVIS.
Treasurer, C. E. ELLSBREE.
Curator and Librarian, ROBERT BOWMAN.
Trustees, J. H. CHAPIN, J. T. PETTEE, C. H. S. DAVIS.
Auditors, GEO. L. COOPER, MISS ALICE H. DERBY.

Mrs. E. B. Kendrick was appointed collector for the ensuing year.

Dr. Davis and Mrs. Kendrick were appointed a committee to revise the list of Directors.

Ninety-second Regular Meeting, FEBRUARY 11, 1889.

Rev. Geo. W. Griffith was elected a member of the Association.

Mr. S. Ward Loper was elected an honorary member.

Messrs. Platt, Andrews and Mrs. Cooper were appointed a committee for the April meeting.

A motion to create a department of Onamatology was laid on the table.

Ninety-third Regular Meeting, MARCH 11, 1889.

Alfred E. Camp was proposed for membership.

Bills of E. A. Horton & Co., and Dr. Davis were referred to Auditors and ordered paid.

The following notice was given by Mr. G. L. Cooper. "I will, at the next meeting of the Association, propose an amendment to the By-Laws creating the sections of Onamatology and Photography."

Ninety-fourth Regular Meeting, APRIL 8, 1889.

On motion, Mr. A. E. Camp's proposal for membership was laid on the table.

Voted, that the motion to create departments of Onamatology and Photography be tabled.

Richard Atwater was proposed for membership.

Matter relating to excursion to Talcott Mountain was laid over to the May meeting.

Messrs. Chapman, Roby and Mrs. Platt were appointed a committee on programme for the June meeting.

Messrs. Davis, Bowman, and Miss Hall were appointed to arrange an excursion to Portland.

Ninety-fifth Regular Meeting, MAY 13, 1889.

Richard Atwater was elected a member of the Association.

Miss May Morse and Mr. W. I. Fenn were proposed for membership.

Resolutions on the death of President Barnard were adopted, and ordered printed and a copy sent to Columbia College.

Messrs. Davis, Bowman and Miss W. H. Hall were appointed a committee to arrange with the New Britain and Middletown Scientific Associations for an excursion.

The resignation of Mr. C. E. Ellsbree as Treasurer was accepted, and Mr. Franklin Platt was appointed to that office.

The matter of the sections of Onamatology and Photography was taken from the table and it was voted not to create those sections.

Ninety-sixth Regular Meeting, JUNE 10, 1889.

Miss May Morse and Mr. W. I. Fenn were elected members.

The various committees were continued to report at the September meeting.

Ninety-seventh Regular Meeting, SEPTEMBER 9, 1889.

The bill of E. P. Judd for books was referred to Auditors and ordered paid.

Voted, that the senior class of the High School be invited to attend the meetings of the Association.

Ninety-eighth Regular Meeting, OCTOBER 14, 1889.

Mr. Fred. I. Newton was proposed for membership.

Messrs. Frost, Platt, and Mrs. Kendrick were appointed committee on programme for the December Meeting.

Ninety-ninth Regular Meeting, NOVEMBER 11, 1889.

Mr. Fred. I. Newton was elected a member of the Association.

One Hundredth Règular Meeting, DECEMBER 11, 1889.

The bill of E. A. Horton & Co., was referred to auditors and ordered paid.

1890.

One Hundred and First Regular Meeting, JANUARY 13, 1890.

The Treasurer's Report was presented and approved.

Report of the Librarian was approved.

Mr. Geo. N. Williams was proposed for membership.

The following officers were elected for the ensuing year:

President, REV. J. H. CHAPIN.
Vice-President, REV. J. T. PETTEE.
Secretary, DR. CHAS. H. S. DAVIS.
Treasurer, FRANKLIN PLATT.
Curator and Librarian, ROBERT BOWMAN.
Trustee, for three years, REV. J. H. PETTEE.
Auditors, G. L. COOPER, MISS MAY MOSES.

Mrs. Kendrick was appointed collector for the ensuing year.

Dr. Davis, Mr. Cooper, and Mrs. Kendrick were appointed a committee to revise the list of Directors.

Messrs. Cooper, Bowman, and Miss Moses were appointed committee on programme for the February meeting.

Voted, that the Association accept Dr. Chapin's offer to donate a collection of Peruvian Antiquities to the Association, and a suitable place be prepared for them.

One Hundred and Second Regular Meeting,

FEBRUARY 10, 1890.

Mr. Geo. N. Williams was elected a member of the Association.

Messrs. Andrews, Chapman, and Mrs. Kendrick were appointed committee on programme for the April meeting.

One Hundred and Third Regular Meeting,

MARCH 10, 1890.

Rev. W. S. Perkins was proposed for membership.

Messrs. Davis, Frost and Bowman were appointed a committee to remove the Cabinets and Library, and to provide suitable rooms for the Association.

Voted, that a check be drawn on the Treasurer for a sufficient sum to pay the janitor of the Universalist Church.

One Hundred and Fourth Regular Meeting,

APRIL 14, 1890.

Rev. W. S. Perkins was elected a member of the Association.

Mr. A. Chamberlain was proposed for membership.

The following bills were referred to the Auditors and ordered paid. E. A. Horton & Co., for $3.00; Horace Smith for $5.60.

Messrs. Platt, Cooper, and Miss Moses were appointed committee on programme for the June meeting.

One Hundred and Fifth Regular Meeting,

MAY 12, 1890.

Mr. A. Chamberlain was elected a member of the Association.

Bill of Mrs. Kendrick for $4.90 was referred to Auditors and ordered paid.

Committee on programme for the June meeting reported that Mr. James Shepard, of New Britain, would lecture on the Stone Age of Connecticut.

Messrs. Bowman, Frost, and Miss Linsley were appointed a committee to arrange for an excursion.

One Hundred and Sixth Regular Meeting,

JUNE 9, 1890.

Messrs. Davis, Frost, and Mrs. Kendrick were appointed a committee to prepare for publication the Fourth Volume of the Transactions of the Association.

Mr. Platt resigned his office as Treasurer on account of his removal from the city, and Dr. G. H. Wilson was elected Treasurer.

One Hundred and Seventh Regular Meeting,

OCTOBER 13, 1890.

Miss Caroline J. Hitchcock, Miss Sarah T. Shaw, and Mr. Judson C. Perkins were elected members of the Association.

Messrs. Catlin and Perkins, and Miss Shaw were appointed committee on programme for the December meeting.

One Hundred and Eighth Regular Meeting,

NOVEMBER 10, 1890.

Routine business was transacted.

One Hundred and Ninth Regular Meeting,

DECEMBER 8, 1890.

Mr. W. L. Cheney was proposed for membership.

Messrs. Wilson, Cooper and Mrs. Kendrick were appointed committee on programme for the February meeting.

CHAS. H. S. DAVIS,
Secretary.

January, 1891.

James G. Percival, M. D.

BY REV. J. T. PETTEE, A. M.

Percival, the Connecticut Geologist.—*Prof. James G. Dana.*

God pity the man who does not love the poetry of Percival.—*J. G. Whittier.*

Berlin has sent to Yale College a great genius in the person of Percival.—
President Dwight.

JAMES G. PERCIVAL was, without doubt, the most remarkable scholar ever produced by Connecticut. He was born in Kensington, a parish of the town of Berlin, September 15, 1795, and died at Hazel Green in Wisconsin, May 2, 1856, in the sixty-first year of his age. The house of his birth, which he so affectionately remembers in a beautiful poem entitled, "Lines on viewing, one summer evening, the house of my birth in a state of desertion," has long since disappeared, but the house where he spent part of his boyhood is still standing, near the Kensington churches, and has recently been renovated by its present owner, Mr. Theron Upson, who has shown his good taste by leaving it, in its renovated state, as nearly like the original as possible. The fact is that the building of the Hartford and New Haven railroad through this part of Kensington, and of factories on the site of "Percival's Mill," have so completely changed the contour of the neighborhood, that it is utterly impossible to find exactly where "the house of my birth" stood—

"The mansion where my infant eye
First saw the rocks, the woods, the sky."

From the poem we know that it was not on a hill, but in a vale, and by a stream—a meadow in front, illumed in summer by "the insect lightning of the night."

I found in Kensington a lady of eighty years, who remembered that, in her girlhood, "a family of the name of Percival lived in an old house in this neighborhood," but added, "it was a very old house and was torn down a great many years ago." This, without doubt, was "the house of my birth" so affectionately remembered in the poem, from which Dr. Percival removed near the commencement of the present century to his new house on the hill. He was, probably, the last occupant of the old house, for soon after 1822, we find it in a state of complete dilapidation.

There is still standing in this neighborhood, just below the mill-site, a house which Percival once owned, where he lived for several years, and from which he moved his great library to New Haven in 1830. A gentleman whose father did the moving, told me he had often heard him speak of it. This house formerly belonged to Dr. Ward, who succeeded Dr. Percival as village physician at Kensington. It was here that James came to study medicine in 1815, and it was here that Dr. Ward upraided him, after he had spent three weeks, apparently fumbling over his books:—"James, medicine is a science, and if you want 'to make a physician, you've got to begin at the foundation and *study*." "Examine me, Dr. Ward, if you please." Dr. Ward did so, and found, to his surprise, that James, in his three week's "fumbling," had possessed himself of the whole contents of his library. This house, though remodeled, preserves many of its original features; the little office on the street, where James studied, looks very much as it did when Dr. Ward left it.

But the house on the hill is where he spent most of his boyhood. It was in this house that his father, Dr. James Percival, died in 1807, when James was but twelve years old. Dr. Percival was not only an excellent physician, but an able business man; his estate was inventoried at thirteen thousand, at his death—a handsome property for those days. James was his second son, and gave early promise of his future genius. When nine years old he had read all the miscellaneous works in his father's library; when eleven, had added those of the parish library; and when fourteen, without neglecting his preparatory studies, had accomplished an amount of reading which would have been considered excessive for a professional man. Hardly anything in the fields of history, science, or literature escaped him, and what he read he remembered. He hardly ever had occasion to read a book twice; once read its contents were his. When he was but ten years old, people were in the habit of coming to his father's house on purpose to hear him talk of what he had read, especially of geography and history. The public school teachers soon confessed that they could teach him no more, and he was put under the tuition of the village pastor, and neighboring clergymen; Dr. Upson of Kensington, Dr. Woodward of Wolcott, and Dr. Brace of Newington, all had the honor of instructing this remarkable boy. Then he was sent to his maternal uncle, Rev. Seth Hart, who kept a classical school at Hempstead, L. I. Here he nearly prepared for college, finishing up with Dr. Brace, and entering Yale in 1810, in his fifteenth year. He easily took high rank in his class, and when he graduated in 1815, would have been assigned the valedictory had not the weakness of his voice, and a habit he had of lisping, in the judgment of the faculty, rendered such an assignment impracticable. Percival, however, accepted a subordinate part, and prepared for it with such care that he spoke admirably. President Dwight was surprised, and said: "Why Percival, I wish I had known you were able to speak so well, we would have given you the valedictory." While in college he gave proof of his genius by solving with ease the most difficult mathematical problems, by writing some of his finest poems, and laying the foundation of his great poem, "Prometheus." He also wrote a tragedy, which was acted at Yale, and solicited for, though not granted to, the stage in Philadelphia. I conclude Percival himself was not satisfied with it, as in after years, he excluded it from his published works.

After graduating he studied medicine, first, as we have seen with Dr. Ward, and then with Dr. Ives of New Haven. When he came to his medical examination, the Medical Board of the College proposed to have some fun at his expense; so each prepared the toughest questions in his own department, and tried to break him down. But it was of no avail; after screwing him for several hours, subjecting him to such an examination as no medical student had ever taken before, they gave it up as a hopeless task, and he graduated with the highest medical honors.

Meanwhile he had charge of Dr. Ives' "Botanical Garden," (the first, I believe, planted in America), and as there was no work in English then upon the subject, proposed to Dr. Ives to write "a library" for botanical students, a work for which he was, perhaps, as well qualified as any man in America, for he loved botany next to geology, and botanized more or less in all his geological excursions.

In reading or hearing of one whom we have not seen, it is natural for us to inquire, How did he look? What was his person?

From all that we can learn, Percival was slender, rather above the middle height, with narrow chest, peculiar stoop; eyes, dark hazel, of uncommon expression; complexion light, inclined to sallow; hair, dark brown. The photo which prefaces this volume is from the steel plate engraving published in his Life, and in his Poems. From what portrait of Percival it was engraved we cannot say with certainty, but probably from the portrait painted by Mr. George A. Flagg of New Haven, in 1831, for Mr. Lyman C. Draper of Madison, Wisconsin, says: "We have in the gallery of our State Historical Society an original portrait of Percival, painted by Mr. Flagg of New Haven about 1831, which we obtained by purchase since Percival's death. *It looks to me very much in expression like the engraving prefixed to the edition of his poems.*" Doubtless the engraving was taken from it; if so, it represents Percival at the age of thirty-six. It is a picture of Percival, the Poet, rather than of Percival, the Scientist. It is greatly to be regretted that we have no portrait of him in his maturer years—say at the age of fifty or fifty-five. But Percival was very averse to sitting for his portrait, and we may consider ourselves fortunate in having as good a one as we have.

In one of many visits to Kensington to locate, if possible, the house in which Percival was born, I asked an invalid lady if she had ever seen him. "Yes," said she, raising herself from her couch, "once, when he came into this neighborhood to see his brother," and then, clapping her hands to her head, "*O! my! what a head!*" People who saw him in his maturer years were very apt to remember that Shakesperian head.

A college acquaintance of mine, resident in Kensington, remembered to have seen him on two occasions, once, when he came as physician to his father's house to attend a young man who had cut his foot in the woods; on which occasion he entered the house, sewed up the wound, bandaged it, and left, *without speaking a word.* Again, on the occasion of the great School Festival in Berlin, (about 1840), he saw him, elegantly dressed, on the outskirts of the crowd, the observed of all observers, though taking no part in the exercises.

If these incidents seem meager for so many visits to Kensington, it may be well for the reader to remember that Percival was really never acquainted with his fellow townsmen, that he lived but a few years among them, was hardly ever in Kensington after 1830, and that an unusual mortality among the aged people of the parish just before the writer's visits, cut him off from his only reliable sources of information.

Percival was usually careless about his dress, though he sometimes dressed elegantly. His old brown camlet cloak is still remembered by the older citizens of New Haven, and his old patent leather cap preserved as a relic in the rooms of the New Haven Historical Society. His diet was very simple. He never indulged in any beverage stronger than tea or coffee. But once in his lifetime was he known to taste wine, and then, though the quantity was small, the effect was phenomenal.

For ten years of his life he kept "bachelor's hall" in a room provided for him, in the attic of the old New Haven Hospital. This room, with very few exceptions, no one was permitted to enter; any who had business with him transacted it outside. He was, however, no misogamist. He naively confesses in one of his letters to his confidential friend, Mr. James L. Yvonnet, "I recollect when I was a mere child, I was strangely electrified by a little black eye," and his Hexli, or Little Witch, shows that he never recovered from the shock. And again, "I can conceive of nothing nearer heaven than a happy marriage." He had his "Highland Mary" as Burns had his, and addressed to her some of his sweetest poems. Twice, in person or by proxy, he proposed to objects of his affections, but in both cases found that he had been anticipated by others. The weakness of Mr. Percival's voice, with a strong tendency to lisp, entirely disqualified him for public speaking. When he delivered his splendid Phi Beta Kappa at Yale, it is said that his poem was not heard by fifty individuals. Strange that he ever thought of preaching, or saw any advantage in being admitted to the bar; and yet at one time he seriously thought of taking orders, and was actually admitted to the bar in Philadelphia. He was a lover, almost a worshipper of silence, and yet an inveterate talker; he would discourse to you for an hour on some favorite theme, and then, the next time he met you, begin just where he left off, with "as I was saying," and talk another hour; and so rich was his discourse that no one wanted him to stop talking, or cared to talk in his presence. It might be said of his speaking, as Ben Johnson said of Bacon, "The fear of every man that heard him was lest he should make an end." He had also an exquisite ear for music; "delighted to pick up, and to touch off, ancient and easy little musical airs," and for the want of a voice, carried around with him an old accordeon, and while he played, moved his lips as though he were singing, though they never uttered a sound.

He was so humane, that when the saddle galled his horse, he took it off and carried it on his own shoulders, and, when in college, he parted company with his chum because he insisted upon killing the rats that infested their room; and finally, he sacrificed his life to his humanity, insisting, in the depth of a Wisconsin winter, and in feeble health, upon going out from Madison to Hazel Green, to take care of his old horse, which another could have taken care of just as well.

His delicacy and sensitiveness were things phenomenal. One of his *affairs du coeur* was broken off because, in the midst of it he accidently touched the hand of his fair pupil; and he was obliged to change his boarding place, when sixty years old, because the excellent woman with whom he boarded, unwilling to lose his rich discourse, persisted in undressing her little boy before him.

His memory was prodigious. We don't see what use he had for books after he had once read them. And yet he had one of the finest libraries in the state. This was the secret of his poverty—all of his money went for books, * * * His moral character beyond reproach. No one ever suspected it of a stain. Calumny never wagged her tongue at him—she never had occasion to * * * By church affilliation an Episcopalian—and buried, at his own request, with the rites of that church.

It must be admitted that he was very eccentric—very unlike others. He lived in himself, by himself, apart from his fellow-men. Very few of his own townsmen knew him. In his early manhood he was the victim of melancholia. Twice he attempted suicide; once his brother found him staggering around the orchard, having taken opium; and once he started for Middletown, to throw himself into the Connecticut, but when a little way from home the phrensy left him, and he returned as sane as ever. To this temporary aberation we are probably indebted for one of his most remarkable poems, The Suicide; "The only instance in literature," as justly remarked by his biographer, "where the dying agonies of a suicide have been set forth in the burning words of impassioned poetry."

Percival was a fiery patriot. In college during the war of 1812, he breathed out his spirit in many a fiery ode; that to New England has never been excelled—"Hail to the land whereon we tread!" "Let foreign navies hasten o'er,"—but every school-boy knows it by heart. A decade later when Greece and Poland, and the South American Republics, were struggling for autonomy, Percival wrote odes that stirred us like the sound of a trumpet.

He hated oppression, at home and abroad, and believed that the time would come, when even American slavery would cease.

"Yes the time will come
When all the fetters violence and pride,
Hypocrisy and fraud, have twined around
The soul of man, shall sever like the flax
Before the furnace, and the united voice
Of earth proclain, that every chain is broken,
And every spirit free. The time draws nigh
When the glad shout shall ring. It will not come
At the loud summons of impatient pride,
But in the silent going on of things
All shall be finished. Let us then await
Calmly the close."

Soon after his graduation, we find him, by the appointment of the Medical Board, delivering a course of anatomical lectures before the college, and the citizens of New Haven, and observe that his lectures are highly spoken of for "the clearness of their demonstrations." Soon after we find him in Charleston, S. C., lecturing on Botany, and, occasionally practicing as a physician; stopping however, in Philadelphia long enough to study law, and be admitted to the bar, although he never attempted to practice. He was the idol of the Charlestonians, notwiths anding his intense hatred of slavery, and some of his finest poems first appeared in the Charleston *Courier*, then the leading literary paper of the South, if not of the whole country. On the morning of March 29, 1822, when he set sail for New York, he contributed this gem to his favorite paper:—

I saw on the top of a mountain high
A gem that shone like fire by night;
It seemed a star that had left the sky,
And dropped to sleep on the lonely height.
I climbed the peak and found it soon
A lump of ice in the clear cold moon.
Can you its hidden sense impart?
'Twas a cheerful look,—and *a broken heart.*

In 1820, he published his great poem, "Prometheus," of which Edward Everett said: "Many of these verses have all the dark sententiousness of Byron, with an uncommonly smooth versification;" of which the *Monthly Review*, a British periodical, at a time when the taunt of Sydney Smith, "Who reads an American book?" was still fresh on British lips, said: "It boasts of a degree of merit far superior to that of any pieces hitherto published on that side of the water;" and of which John G. Whittier wrote in

1830, "God pity the man who does not love the poetry of Percival! He is a genius of nature's making,—that singular and high-minded poet. His aim has always been lofty,—up, up, into a clearer sky and a holier sunshine; and if he has failed at all, he has failed in warring with the thunder cloud, and crossing the path of the live lightning. His 'Prometheus' is a noble poem. There is no affectedness about it—all is grand and darkly majestic. It has few soft and delicate passages,—no tinge of the common love poetry of the day,—no breathing of vows to rose-lipped angels in petticoats,—no dalliance with a lady's curls. He left *such* things to the dandies in literature,—to our love-sick and moon-struck race of rhymers,—and went forth in the dignity and power of a man, to grapple with the dark thoughts which thronged before him, moulding them into visible and tangible realities. The apostrophe to the sun, in this poem, we have ever looked upon as the most magnificent specimen of American poetry within our knowledge."

In the judgment of the poets and critics of his day, but one, if anything, prevented Percival's holding the first rank among American poets,—it was the haste with which he wrote, or more properly, the haste with which he published. But he wrote from inspiration,—whenever the poetic *afflatus* seized him, and consequently, felt little disposition to correct and improve, when the *afflatus* had passed off. He virtually acknowledges this in his preface to the second part of "Prometheus;" "I do not like the poetry that bears the marks of the file and burnisher; I like to see it in the full ebulition of feeling, and fancy, foaming up with the spirit of life, and glowing with the rainbows of a glad inspiration;" and to his friend, Prof. Fowler, who intimated that a little filing and burnishing might improve some of his poems, he only answered, "Minerva sprung from the brain of Jupiter a finished goddess at birth."

No one ever had a higher idea of the poet's calling than Dr. Percival. He regarded it as something sacred. He seemed to write by inspiration, and when inspired was raised above all sordid considerations. He would have regarded it as a prostitution of his poetic genius to write for money, *ie.* to write *poetry* for money. He would write prose for money—compile, edit, and translate; and when his poems *were* written, did not object to collecting and publishing them on the most favorable terms,—but to *write* them for money, so much a line, so much a page, was a profanation and desecration he could not be guilty of. This probably was the reason that so few years of his life were devoted to poetry, and that he never wrote, nor quoted poetry when engaged in his geological excursions. Prof. Charles U. Shepard, who was associated with him in the geological survey of Connecticut, and to whom was entrusted the mineralogical part of the survey, says that in the year he was with him he never heard him make any allusion to his poetry, and one would certainly seek in vain, in any of his prose works, for a poetic thought, or a poetic quotation. Except when in the heavens of poetry he was the dryest and most prosaic of writers. He lived in two worlds, and a great gulf was fixed between them.

Had not Percival acquired a world-wide celebrity as a Poet, he would have been regarded as one of our best prose writers. Prof. Shepard says justly, "His prose style is a rare exemplification of classic severity and perspicuousness. In each paragraph the ideas arrange themselves in faultless connection, like the molecules of a crystal around its center. The sentences are not long, the construction is simple, the words are English in its purity, without admixture of foreign phrase or idiom. But the most striking peculiarity of his diction is the utter absence of ornament; for Percival evidently held that the chief merits of composition are clearness and directness. Poetic imagery, brilliant climaxes and antitheses, fanciful or grotesque forms of expression, he rejected as unfavorable for that simple truth for which he studied and wrote. This dry, almost mathematical style, was no necessity with him; few men, surely, have had at command a richer vocabulary, English and foreign, than Percival; few could have adorned thought with more or choicer garlands from the fields of knowledge and imagination."

But Percival's poetic life was a brief one. Though he lived to the age of sixty-one, most of his poems were written before he was twenty-five. Almost all that is contained in the two published volumes was written between the years 1815 and 1830. The rest of his life was devoted to science and language.

In 1824 he was professor of Chemistry and Natural Science at West Point Military Academy; in 1825, an army surgeon at Boston. For several years he was engaged in preparing an American edition of Malte Brun's great geography, in seven massive volumes. It had already been translated into English, and all that Dr. Percival was expected to do was to prepare an American edition; but he found the English version so imperfect that he went back to the French, and translated it *de novo*. Some ten years of his life he immured himself in almost monkish seclusion in New Haven, two of which were spent on Webster's great dictionary, preparing it for the press, and eight on modern languages. The Basque, of which it is said, "Satan once tried to learn it, but gave it up as a bad job," especially interested him; he not only mastered it, but wrote a brief grammar of it. When the great Norwegian violinist, Ole Bull, visited New Haven, 1844, Percival welcomed him with an ode in the Danish language. which was then the court language of Norway; and it is doubtful whether, at that time, there was another native American who could have done it. A dozen languages flowed from his tongue; as many more were mirrored in his brain. The last poem he ever wrote was in German, to serve as a campaign song at the West, and he dashed it off as quickly as he would an English song—the exact time was two minutes.

To those who have followed me in this rapid review of the life and labors of Dr. Percival, I know that he must seem fickle and unstable; the old adage of the rolling stone must more than once have occurred, and perhaps the doom pronounced upon the fickle son of Jacob, "Unstable as water, thou shalt not excel." Engaging in so many different pursuits, so opposite in their character, and requiring, apparently, such different powers and preparations, it is difficult to see how he became great in any of them. The secret lay in his powers of abstraction and concentration. He could go from subject to subject without the least confusion, and apply himself as intently to one thing as another. And then he attempted but one thing at a time. When translating he knew nothing of editing; when engaged in science, nothing of literature; when writing poetry, he knew nothing of geology; when engaged in geology, nothing of poetry. This power of abstraction —separating himself, completely and entirely, from everything he was *not* engaged in, was the secret of his success in everything that he *was* engaged in. Then his mind was such, his knowledge so vast, his reading so extensive, his memory so retentive, that he could not help succeeding in whatever he undertook. The natural element of his mind was greatness, and by the simple application of its forces, he became eminent, whatever way these forces were directed.

But, however we may account for it, the fact confronts us in his life and works, that, in poetry and in prose, in science and in song, in the ideal realms of poetry and in the cells of literature and philosophy, James G. Percival stood without a peer among the scholars of his age. A townsman of his, Edward W. Robins, Esq., has not exaggerated in declaring him "Eminent as poet, mathematician, geographer, geologist, botanist, naturalist, philologist, and linguist, combining in himself almost contradictory attributes, making him truly a universal genius."

But it is to James G. Percival as geologist, rather than as a poet, that the scientific world is indebted; and it is in this character, I am aware, that he should be presented in these Transactions.

Professor Dana has paid him the very highest compliment by speaking of him as *the* Connecticut Geologist. But this is not the only compliment from the geologist of the present to the geologist of the past.

Some twenty years ago Prof Dana brought a party of his students, for geological study, to our "Hanging Hills," and that he was profoundly impressed with the importance of Dr. Percival's work in exploring the *trap*, appears from his report: "The knotty complexity of this trap region was first unravelled by Percival, who found that remarkable system and order prevailed among the numerous dykes." "In my opinion, no one in the country has done better work in geology, or work of greater value to science." And again, speaking of Percival's report of the Geological Survey of Connecticut, "There is, (in this report), not only testimony to assiduous labor, but an exhibition of results sufficient to teach philosophy to the mind capable of appreciating them. The work which he accomplished was, in the first place, an extended topographical survey of the state, and, secondly, a thorough examination of the structure and relations of the trap ridges, with also those of the associated sandstone. And it brought out, as its grand result, a system of fundamental truths with reference to the fractures of the earths crust, which, as geologists are beginning to see, (1865) are the very same that are fundamental in the constitution of mountain chains. The earths great mountains and the ranges of Central New England are results of subterraneum forces acting upon the earths crust according to common laws. The State of Connecticut, through the mind and labor of Percival, has contributed the best and fullest exemplification of these laws yet attained, and thus prepared the way for a correct understanding of the great features of the globe."

Prof. Benjamin Silliman said of this Report in the January number of the American Journal of Science for 1843: "When we remember the learning and talent of the author, and the laborious accuracy with which he investigates every subject which occupies his attention,—that he began this exploration in 1835, and has pursued it with great diligence till the present year—that he has been personally and on foot in contact with every one of the 4600 square miles of the state, and has carefully collated and compared more than 8000 specimens, besides much more numerous dips and bearings,—*it can not be doubted that he has laid the foundation for all future investigations into the geology of Connecticut.*"

Prof. Shepard, to whom was entrusted the mineralogical part of this survey, says this, "Of this remarkable production it may be briefly said, that it will ever remain a monument to the literary and scientific powers of its author. It describes every shade of variation in the different rocks, and their exact distribution over every portion of the State. This it accomplishes with a minuteness never before essayed in any similar work."

Percival's most exhaustive study was the *trap*. He may be said to have interpreted the trap system of the Connecticut Valley. And he was the first to interpret it correctly. Before him, geologists had considered this formation as extending in one line from West Rock in New Haven to Mount Tom in Massachusetts. Percival showed that it was not so; "that there was no one line; that, on the contrary, many ranges existed, having the same general north and south trend; and, moreover, that each was made up of a series of isolated parts. He also found that the ridges which compose a range do not always lie in the same line, but that often the parts that follow one another are successively to the east or west of one another, (*en echelon*, as the French style it); and, further, that the parts of the component ridges of a range were often curved, or a succession of curving lines. He discovered, too, that in the region of the Meriden Hanging Hills the trap ridges take a singular east and west bend across the great central valley of the State,—a course wholly at variance with the old notions." This it was that forced the Connecticut out of its course, and made it empty at Saybrook instead of emptying at New Haven.

It was the *curvilinear trend* of the trap—its tendency to arrange itself in *crescents* instead of straight lines, that Percival claimed as his great discovery. And he says in a letter to Sir Charles Lyell, October 24, 1843, "This system of arrangement was long since observed by me, as early indeed as my attention was first directed to geology, (when a student), from the circumstance, I may say, that my native place was in the very center of the larger trap formation in Connecticut." Only once, to my knowledge, has this claim ever been questioned, and then the question was quickly settled in favor of Percival.

In 1835 Dr. Percival was appointed by Governor Edwards, State Geologist of Connecticut, and Prof. Charles U. Shepard as mineralogist, associated with him in the survey of the State. To this work he devoted five years, walking the State from east to west, and west to east, and setting foot in every square mile of its territory. No State was ever so thoroughly or so scientifically surveyed. The Report however was a great dissappointment to the legislature which authorized it. What the legislature wanted was a survey that would develop the (supposed) mineral resources of the State; but what Percival wanted, and what he accomplished, as far as he could in the time at his disposal, was a scientific geological survey; and had he been allowed to perfect it according to his plan, it would have given Connecticut such a survey as no other State or County had ever had.

The Report of this survey published in 1842, though a geological classic, and always referred to with highest deference by geologists, is, unfortunately for the popularity of its author, and more unfortunately for the benefit of the reader, written in such a dry, mathematical style; so utterly devoid of all ornament, not even giving the author's opinions or conclusions, but page after page of bare geological facts—*the rocks as he found them*—referred, usually, not to well known localities, but to arbitrary geological boundaries drawn in the author's mind, or to the map accompanying the Report, which, unfortunately, is somewhat obscure, and, like all maps bound up in printed volumes, difficult to consult while reading, that, as Prof. Shepard justly remarks, "It has never found a single reader among the persons for whose benefit it was written, and to be of use to common geological students it would need to be translated into the vernacular of descriptive geology." I can think of nothing that would be of more assistance to the common student in reading the Report than the map which accompanies it, *drawn on a large scale,* hung up before him, so that he could look up from his reading as often as he chose and consult it. Had one the prodigious memory of Percival, or could one carry his map clearly in his mind, I am aware, such an expedient would not be necessary.

A word upon the economic results of Percival's surveys. His Connecticut survey was strictly scientific; yet Prof. Dana says it was not without practical results: "for he was the first to explain correctly the origin of the iron ore beds in Kent, and similar beds in the Green Mountain range." He conferred immense benefit to the state by discouraging mining operations in localities where they would result in nothing but loss, in this way he saved to the state many times the cost of its survey. And when, upon the fame his state survey had given him, he was called to survey for companies and individuals, his surveys were of immense pecuniary value. By following his advice, iron ore mines in Nova Scotia which were about to be abandoned as unprofitable, were made very productive. In 1853 he was engaged to demonstrate the trnth of certain theories concerning the lead mines in Illinois and Wisconsin. He succeeded in establishing the very important fact that the mineral extended several hundred feet below the surface of the earth, and it was thought that his investigations had added at least a million dollars to the value of that reigon; and it will never be known how much he saved to the state of Wisconsin by telling its citizens that it would do no good to look for coal or oil in their state, (except in "pockets,") ***as the whole state was below the coal formation.***

It was his great success in surveying for private parties in Wisconsin that recommended him to the governor of the state as a proper person to make the geological survey of the state, which had been ordered by the legislature of 1853. He lived long enough to make two reports to the legislature. Those reports lie before me. They are not as dry and uninteresting as the Connecticut Report. They are more practical—keeping in view the primary object of the Wisconsin survey, to develop the mineral resources of the state. A circumstance connected with the making of the first report, as given by Edward M. Hunter, then Secretary of State of Wisconsin, shows the astonishing power of Percival's memory. "You have his Geological Report for 1855. He wrote this, to my knowledge, without ever having made a single memorandum to assist his recollection of the many and complicated details which are embodied in the Report. By the order of Governor Barstow a small room had been partitioned off for his use. Here, with no other materials than pen, ink, and paper, he wrote out from memory the Report I have mentioned." The great Connecticut Report was prepared in much the same manner. Says its author "It was written mainly from recollection, with only occasional reference to my materials, and under circumstances little calculated for cool consideration." The fact is his memory was prodigious. It would be somewhat extravagant to say that he never forgot anything, but perfectly safe to say that no one could name anything that he ever forgot, or give an instance of his having forgotten anything. Prof. Shepard says: "During the year following the survey, when we had frequent occasion to compare recollections, I observed that no circumstance of our labors was shadowy or incomplete in his memory. He could refer to every trifling incident of the town, recall every road and path that we had followed, every field and ledge that we had examined, particularize the day of the week on which we had dined or supped at such a tavern, and mention the name of the landlord." And when asked how he was able to remember such minutiæ Percival replied that it was his custom, on going to bed, to call up, in the darkness and stillness, all the incidents of the day's experience in their proper order, and cause them to move before him like a diorama, through a spiritual morning, noon, and evening. He said that in this purely mental process he beheld objects more distinctly than he saw them in reality. This was the only system of mnemonics that he used, and it is the only one that is worth using. But we forbear. A volume would not suffice to give a full portraiture of this remarkable man. He died May 2, 1856, at Hazel Green, in Wisconsin, greatly beloved, and highly respected by the citizens of that state. And it is pleasing to know that his memory is being revived in the neighborhood of his birth. The park which has recently been laid out on West Peak by the enterprise of Mr. Henry N. Johnson, of New Haven, has already taken his name, "Percival Park," and we hope the day is not far distant when the Peak itself will assume it. West is a relative word, and, as here used, its appositeness depends entirely upon the position of the speaker; to us at Meriden it *is* west, but to the people of Southington it is south or east. I am aware that of the three peaks which compose the mountain it is the most westerly; but this is not what we are thinking of when we say West Peak, but only of its bearing from ourselves. I therefore suggest that henceforth it be known as *Percival Peak*, in honor of the great geologist, whose birth-place was hardly five miles from it, and who, more than any other man, developed and interpreted the trap formation to which it belongs.

In considering the life and character of such a man as Percival it is natural for us to inquire: Was his great heart in sympathy with the religious sentiment of his age? From the general tenor of his poems, from the testimony of his most intimate friends, from a very important purpose of his life, and from all the circumstances of his death, we have no hesitancy in answering that it was.

That he was not an atheist is sufficiently evident from the fact that he belonged to an order into which no one can enter without acknowledging his belief in the existence of a Supreme Being, and whose "First Great Light" is the Holy Bible. He is the author of the Master's Song, Royal Arch Song, and Select Master's Song, found in Masonic manuals. With the exception of three lines in his "Prometheus," I find nothing in Percival's poetry that does not agree with the accepted theology. I refer, of course, to this passage, Part I, Stanza 148:

"I ask no pity, nor will I incline
Weakly before the cross, nor in the blood
Of others wash away my crimes."

This his Christian friends, Professor William C. Fowler among them, urged him to expunge, as being likely to excite the prejudices of Christians against him. But this he declined to do, saying "that he could use poetically unchristian sentiments or pagan mythology without subjecting himself to the charge of adopting either." But against these three lines we may place the spirit and sentiment of all his poems. Many are decidedly religious, while through them all flows a sentiment of faith and piety which proves the author in harmony with the Christian sentiment of his day. As in the description of a thunder-storm, Prom. I, 126, 127:

"Who can tell
The spirit's awe? as if it heard its knell,
It bows before the Power, whose hand controls
Lightning and wind and waves, who loves to dwell
In storms, and on its path the tempest rolls,
Whose words are bolts, whose glance electric pierces souls,
And makes the bold blasphemer pale with awe,
And stills the mad-man's laugh, and strikes with dread
The brow that bore defiance to the Law
Stamped on the universe; he hides his head
In darkness like the ostrich; all those led
By his once fearless mocking slink away,
And o'er them prostrate, wrathful angels tread,
And draw their fiery arrows, and repay
With fear and death the hearts that dare to disobey."

Or in the exquisite portraiture of the dying wife in "Consumption":

And though the glow from her cheek be fled,
And her pale lips cold as the marble dead,
Her eye still beams unwonted fires
With a woman's love and a saint's desires,
And her last fond, lingering look is given
To the love she leaves, and then to Heaven,
As if she would bear that love away
To a purer world and a brighter day."

Professor Charles U. Shepard, for twenty-five years his most intimate friend, in a most able and interesting article contributed to the *Atlantic Monthly*, July, 1859, says: "Religion he never alluded to but with deepest respect. Talking to me of Christianity, he quoted the observation of Goethe, that "*It had brought into the world a light never to be extinguished.*" He expressed an honest esteem for the doctrines of the Evangelical clergy, and even approved, though more moderately, the religious awakenings which occur under their labors."

We learn from his life that at one time he thought seriously of taking orders in the Protestant Episcopal Church, of which he was a member. Now it is utterly inconceiveable how such a pure and conscientious man as Percival should have thought of entering the Christian ministry, had not the sceptical clouds which obscured his youthful intellect been dispelled. And when the final hour drew nigh—when he laid down his hammer and his bag at Hazel Green in Wisconsin, in his last sickness, he was overheard in prayer, on several occasions found upon his knees, and at his own request, buried with the solemn and impressive funeral service of the Church of which he was a member.

The "Light" which Goethe spoke of as "never to be extinguished," was not extinguished in his mighty soul, but shone with a calm and serene radiance when his feet touched the valley and shadow of death.

"Soul of the just, companion of the dead!
Where is thy home, and whither art thou fled?
Back to thy heavenly source thy being goes,
Swift as the comet wheels to whence it rose.
Doomed on its airy path awhile to burn,
And doomed, like thee, to travel and return.

So hath the traveler of earth unfurled
Her trembling wings, emerging from the world;
And o'er the path by mortals never trod,
Sprung to her source, the bosom of her God."

SEWAGE.

ITS CARRIAGE AND DISPOSITION.

READ BEFORE THE MERIDEN SCIENTIFIC ASSOCIATION,
NOVEMBER 10, 1890.

BY GEORGE L. COOPER.

It seldom happens that a city grows to the size accorded to Meriden, even by the grudging and much abused census of 1890, in the entire absence of a system of sewage disposal. It is needless here to say that the failure to provide adequate facilities in this direction comes not so much from any lack of public spirit or enterprise on the part of our citizens as from the inherent difficulties of the case.

Before entering upon the subject or rather subjects of the transportation and final disposition of sewage, we may pause to define two of the words to be most frequently used, as well as to note a fact familiar to some good housekeepers, but often neglected by the less experienced. Under the term sewage, I shall include all such household, stable and factory waste products as usually find their way into a drainage system. The word sewerage refers only to the pipes, conduits, tanks, etc., in which this waste matter is carried. I am aware that this distinction is unrecognized by Webster and other alleged authorities. It is, however, convenient and is well established among engineers.

The fact to be noted is that much may be done to reduce the volume of sewage in three ways; first, by the entire separation from the rest of the inorganic matter, as ashes. These are always useful in as hilly a city as ours for filling. Where the soil is clayey as is not the case here, ashes are much used to dig into the soil to lighten and improve it. Again, garbage or any waste food product which is useful to animals, may be set aside and will always find self appointed scavengers ready to remove it. Housekeepers can not be too careful to keep bits of broken glass and all poisonous matters out of the garbage, as the death of a domestic animal is a serious matter to a poor family. In the third place, much kitchen refuse may be advantageously burned in the range fire. It is not necessary in doing this to extinguish the fire, it is requisite to use some care first in drying the waste, where this is necessary, then in putting it on in small quantities, and at a time when a bright strong fire is not required.

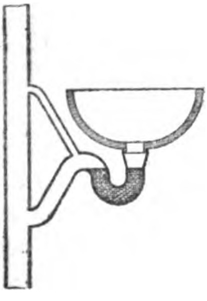
It may be necessary to impress upon your minds that the transportation and the final disposition of sewage are distinct problems. Three systems of transportation are in use, known respectively as dry earth, pneumatic and water carriage. Of the dry earth system little need be said. It has been largely used in Manchester, Birmingham and other English manufacturing towns for twelve or fifteen years. It is doubtful if such a method would be favorably regarded in an American city. It may be advantageously used in detached country houses.

The pneumatic system has been adopted in Leyden, Amsterdam and one or two other cities of Holland. The Leirnur system, as it is called from the name of its inventor, consists essentially of a central sunken reservoir, the ordinary underground conduits leading into it and a pump by means of which air is exhausted from the central reservoir and the contents of the pipes drawn into it. In a city almost absolutely flat and at a level below that of the adjacent sea, such a scheme as this is perhaps the only possible one. It goes without saying that it is highly expensive, both in first cost and in maintenance, as well as difficult to operate and keep in order. Its use will probably always be confined to a few tide-locked Dutch cities.

The water carriage system of transporting sewage is in nearly every case the most feasible as it is the most familiar. It has been adopted in nearly every civilized city and large town, Meriden being an illustrious exception. The disadvantages of this plan are that the bulk of foul matter is greatly increased, and that the agricultural value of the sewage is seriously lessened by its dilution. In most cases these objections are unimportant, the unmixed surface water being frequently too foul for any useful purpose and the value of the sewage as a fertilizer being usually less than the cost of converting and conveying it.

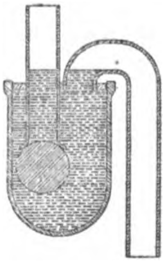
Water carriage systems may be either "separate" or "combined." In the first case the sewage proper is carried by a sewerage distinct from that which carries the rainfall, or the latter may be omitted. In the "separate" system the foul water sewers may be of relatively small size, as they are not compelled to provide for heavy and sudden rains. In some methods of final disposition too, it is quite advantageous to reduce the bulk of matter to be handled. As a notable example of this method, may be named the city of London, where it has been deemed best to carry the household waste water with the solid matters through one sewerage system, and to provide a separate one for rainfall. This plan was recommended by the Metropolitan Sewage Discharge Commissioners in their report for 1884, and is, I understand, being adopted where new sewers are required. Where increased facilities are demanded in districts already provided with sewerage, the old and presumably leaky pipes are used for rainfall, the new for sewage proper. This system has been introduced in Memphis, Tenn., and meets with popular favor.

The "combined" system, where the surface rain water is a trusted and valuable agent for carrying the sewage, is, for cities of moderate size, undoubtedly the simplest and most satisfactory. It needs no elaborate description. We are familiar with the house ganglion of lead and iron pipes and the iron or tile drains laid in trenches in the streets. It is clear that these should be air tight in the one case to prevent the escape of the dreaded sewer gas into our houses, in the other to prevent the contamination of the earth. We all know that waste pipes in houses should be well trapped—some of us have discovered what a poor safeguard a good-looking trap may be. I illustrate in section an ordinary "S" trap, placed



between a wash bowl and a vertical waste pipe. Any one of a half dozen accidents may render this trap useless by emptying it of the retained water. In the first place, an evaporation of one-half of the water in the trap will break the seal; that is, permit the efflux of gas. Again, the distance from the surface of the retained water to the bottom of the partition is in small traps not much more than one inch. Considerable quantities of gas are evolved from decomposing sewage, and if the sewer is not ventilated, as by leaving open the upper end of the stand-pipe above the roof of the house, only one half pound of back pressure will suffice to force bubbles of gas through the water in the trap. Once more, it sometimes happens that a shred of cloth or a few threads from a towel will hang over the upper bend of the trap and form a capillary siphon, which will soon empty it. But the plumber's greatest enemy is siphonage by suction. . Let us suppose water from a bowl or bath, located on an upper floor, to rush with some force down the vertical waste pipe. A partial vacuum will be formed in the trap connection and the pressure of air from above will force the water out of the trap. The ordinary remedy for this trouble is trap ventilation. If a small pipe is carried from the upper bend of the trap to the stand-pipe, as shown in the drawing, air will be supplied to take the place of that exhausted from the trap by the stand-pipe itself, unless, indeed, the column of water in the stand-pipe is long enough to cover both points of connection at once.

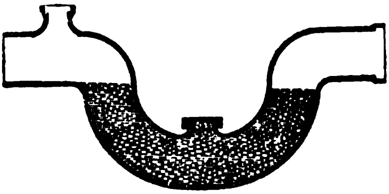
To remedy the difficulties of back pressure and siphoning, many forms of trap have been devised. One of these is the Bower trap, of an early form, of which I show a rude sketch. It will be seen



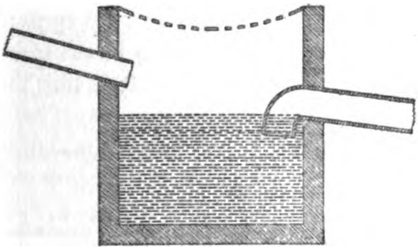
that the seal is deeper and the body of water much greater than in the common "S" trap. The cup is of glass, later of lead, screwed on the disc with a rubber washer between them. If any leakage occurs it will be of water, which can be detected, and not of the subtler gas. The ball shown is of rubber, lighter than the water, and so placed as to float up into the mouth of the pipe leading from the bowl, the pipe being cupped out to receive it. The ball is easily displaced by water flowing into the trap, but prevents back flow of gas, caused by sewer pressure.

I will not speak of gases absorbed by the retained water in a trap and given off to the air of the room, as this action is seldom considerable and never so when the bowl is frequently used.

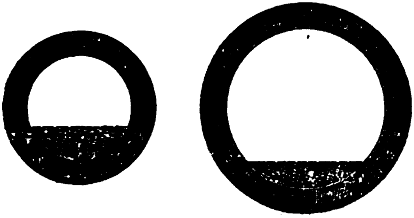
A good connection between the house waste pipe and the sewer is through a pocket or running trap, such as I have sketched. You will note that the trap is provided with a tightly-covered hand hole, through which it may be cleaned. The ventilating pipe should, of course, be attached to the sewer side of the trap, as distinguished from the house side, and should not open to the air near a window or door of the house.



My next sketch is a vertical section of a grease trap, useful where hot greasy water from a kitchen is emptied into a sewer. The tank or receptacle is of considerable size and being sunk in the earth rapidly chills the water which runs into it. The grease rises to a point above the mouth of the effluent pipe and may be skimmed off by removing the grated cover.

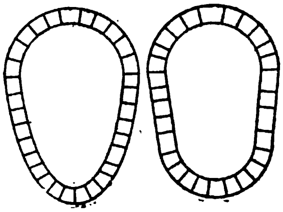


Private sewers, connecting a dwelling house with a street main, are usually of glazed earthenware tile, circular in cross section. The size of these should be sufficient for the duty required of them, but they should never be larger than is needed. I illustrate a four



and a six-inch tile, each carrying the same mass of water. It is plain that the friction between the pipe and its contents is directly as the perimeter wetted and inversely as the depth of the stream. Hence, other things equal, the flow will be much more rapid in the small pipe than in the larger one. Beside this the deposit of silt will be greater in proportion as the uncovered portion of the pipe approaches the horizontal. Here again, the advantage is with the smaller pipe.

These circular glazed tile are made up to 24 to 30 inches in diameter. Above this size sewers are usually built of brick or stone. The ovoid form shown at the left of my next sketch is of Assyrian origin and has never been improved upon. It has been adopted in Paris, the best sewered city in the world, and generally by American engineers. When I say that this form of sewer has been adopted in Paris, it is not in ignorance of the fact that the large transit sewers of that city are immense conduits, with vertical sides, used for the conveyance of water and gas pipes, electric wires and the like, and in which the sewage proper is carried in an open drain centrally placed. The other form shown in the drawing was designed in England, where it is still in general use. It is not quite so well adapted to carry a mimimum quantity of water, but as its sides are more nearly vertical it offers somewhat greater resistance to pressure from above. This is only of importance when the sewer is laid near the surface in a district of heavy travel. In our climate a sufficient depth to prevent undue pressure is secured by the necessity of laying the pipes below the frost line.

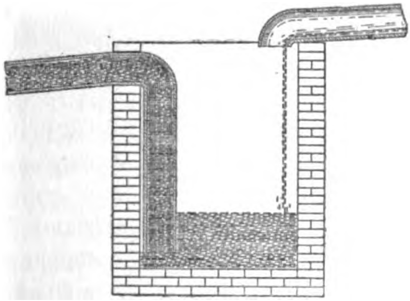


Three factors must be taken into account in determining the capacity of a given street sewer on a combined system. These are the quantity of sewage to be carried, the possible (or rather probable) rainfall and the lay of the land.

The amount of sewage is usually considered equal to that of the water consumption, which, in the cities of this country varies from 30 to 90 gallons or more per day per capita. I am not informed what quantity is daily used by each inhabitant of Meriden. It is evident that the adoption and use of a water carriage sewerage system would add very much to the present consumption.

Rainfall is, of course, a highly variable constituent. In a compactly built city, it is usually assumed that from 33 to 40% of the surface water finds its way into the sewers. With our porous soil this percentage would be lessened. Taking into account the ample impaved grounds which surround most of our houses, we see that an estimate based on data gained in Berlin, and found correct in closely packed, stone paved New York City, would be excessive here. It is probable that of quick driving rains, which most tax the capacity of the sewers, not more than one-eighth of the fall would enter them.

The lay of the land on which the pitch or fall of the sewer depends, is an important factor in calculating the required capacity. In order that a sewer pipe may be self-cleaning, the stream of sewage should move through it at a rate of not less than 150 to 160 feet per minute. In many of our hilly streets a much higher velocity could be obtained. On level ground and particularly where the presence of rock near the surface renders deep ditching very expensive, choking of the sewers is avoided by the use of flush tanks. Field's flush tank may be taken as a type of these. My sketch shows a simple form of this device. It will be seen that the small confluent stream is received in a relatively large tank. The mouth or discharge end of the effluent pipe is supposed to be below the bottom of the tank, so that this pipe forms a siphon and begins to empty the tank as soon as the inflowing liquid reaches the level of the bend of the siphon. Hence the discharge pipe is always either full or empty and does not have a small silt depositing stream constantly leaking through it.



There are many ingenious contrivances which I might show and details which I might elaborate if time permitted. It suffices to say that no problem in sewage construction would arise in our city, which ordinary engineering skill and experience could not easily solve.

Of most moment to Meriden, is the question of the final disposition of sewage. Of this subject also, three grand divisions suggest themselves, discharge into the ocean, percolation into the earth, and chemical precipitation.

Discharge into the sea either directly or mediately through a river or creek is the most common, and to most cities the least costly, method.

It is said of an English clergyman of a generation or more since, that he called upon his hearers to admire the especial wisdom of Providence in causing the large rivers to flow past the great cities. Judged by this gentleman's standard, Meriden could not have been intended to become a metropolis.

The object of the discharge of sewage into the sea is its oxidation, its dilution and the bodily transference of the waste matter to places where it can do least harm. It is true that a considerable portion of the sewage is rapidly combined with the free oxygen of the air held in solution by the water. But it is also true that the insoluble sludge and silt of sewage so disposed of is often a nuisance. To prevent tidal washing many large seaboard cities build immense receiving tanks which are only opened during ebb tide. In London such influx is permitted only during the first three hours of each ebb, yet the Thames is choked with sludge, washed up and down with every tide, and its whole channel is filling up with silt. In New York thousands of dollars are annually expended in dredging up the silt and detritus from the bay and carrying it out to sea.

The oyster planters tell us that Long Island Sound is floored with old boots, overshoes, tin cans and sludge, and that oysters are being poisoned by the million. Where cities are situated on river banks their sewage is often the means of injuring or destroying the water supply of the towns lower down the stream, beside filling the channel of the river itself. In short, this plan once considered the ***summum bonum*** of sewage disposition is now held to be limited in its application and always a source of possible danger.

Percolation into the earth is effected in three ways. Of these the first is broad irrigation or sewage farming in its simplest form. For this is required a tract of land of considerable size and of a loose sandy soil, over which the contents of the sewers are distributed, either directly or through pumps. Eight to ten acres per thousand of population is the minimum allowance. Carefully managed the farm is not found in practice injurious to the health of the neighborhood, and while the crops produced are not markedly superior to those of other well-tilled farms, they at least serve to lessen the cost of sewage disposition. Many successes in this line have been scored in England and several here at home. In some English towns the water of underdrainage from the farm has been found pure enough to be safely discharged into a river from which the water supply of an adjacent town is drawn.

Near to this method in principle and practice is what is called "intermittent downward filtration." An English commission, appointed more than twenty years ago, to consider the subject of river pollution, suggested the idea that if sewage were passed through a porous soil intermittently so as to give the interstices of the soil time to discharge themselves of liquid and refill with air between each saturation, oxidation of the sewage would be much accelerated. The original proposer of this plan, Dr. Frankland, held that one-half acre per thousand of population would be sufficient for the purpose the land, of course, to be kept under cultivation. In practice not less than twice the acreage first estimated has been found necessary. The land must be well underdrained, say at six feet below the surface. A later English commission—in 1884—recommended this method for the disposition of the sewage of London. As nothing, so far as I know, has been done in this direction up to date, it would appear that in London—and Meriden—sewage matters require much preliminary discussion.

An objection to this system is that the surface of the farm is apt to choke with sludge, which interferes with filtration, injures the growing vegetation and is offensive.

A third method is filtration through an artificial bed of sand, ashes, loam, charcoal or the like. Such filtration may, of course, be either constant or intermittent. It is open to the objection just noted, is expensive and is only to be considered in clayey districts where no proper soil could be found for either of the former methods. I know of no instance where this plan has been adopted on a considerable scale.

It is evident that these methods may be combined in several ways. Thus with an intermittent system it would be well to have a reserve farm which could be used for broad irrigation to relieve the smaller field and to enable it to be fallowed and cleared of surface accumulation when this became necessary.

The last method of sewage disposition with which I will tax your patience is chemical precipitation. It is well known that when a liquid holding solid matter in suspension is allowed to stand or to move very slowly it "settles," as a housekeeper would say, that is, the solid matter sinks to the bottom. In sewage this process is much too slow to anticipate decomposition. It is assisted by the introduction of a heavy inorganic body, as lime.

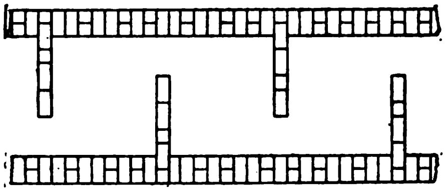
When this substance alone is used, about one pound of quicklime already dissolved in water is added to each 500 gallons of sewage and well mixed therewith. A glutinous mass known as sludge soon sinks leaving a relatively clear supernatant liquid. The sludge is drawn off from the bottom of the tank, pressed and dried. Some attempts have been made to utilize it as a fertilizer, but it has little value. It may best be disposed of by burning or it may be carried out to sea. At Leeds, England, this process is carried on with good success, the effluent water being allowed to flow into the Humber. Several English patents have been taken out for improvements in this process.

Alumina sulphate is used with the lime in one case. In another, known as the A. B. C. process, from the initials of the substances employed—alum, blood and clay—no lime is used. This method gives fine results but is more expensive. Where alumina sulphate or the A. B. C. process is used the sludge has some commercial value in agriculture, as a considerable portion of the soluble matter is precipitated with the inorganic or insoluble mass.

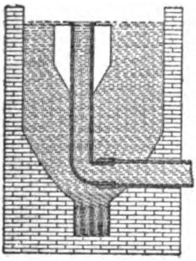
I have here two clean test tubes which I will fill with water, holding in suspension garden soil and organic matter. Into one I put two or three drops of alumina sulphate and of lime water, commonly called milk of lime, mixing them thoroughly with the foul water by shaking. A few minutes suffices to show the difference in the rate of precipitation between the liquids in the two tubes. You see that already the liquid in this tube is separating into a clear water and a thick, somewhat viscous mess.

As an example of the combined system which seems to work well the case of East Orange, N. J., is interesting. Milk of lime and alumina sulphate are the agents used. After these are added to the sewage it is passed through a brick main 100 feet in length, and provided with internal battering partial cross partitions by which the liquid is thrown from side to side and thoroughly mixed.

I show a top plan view of a portion of this main. It then enters



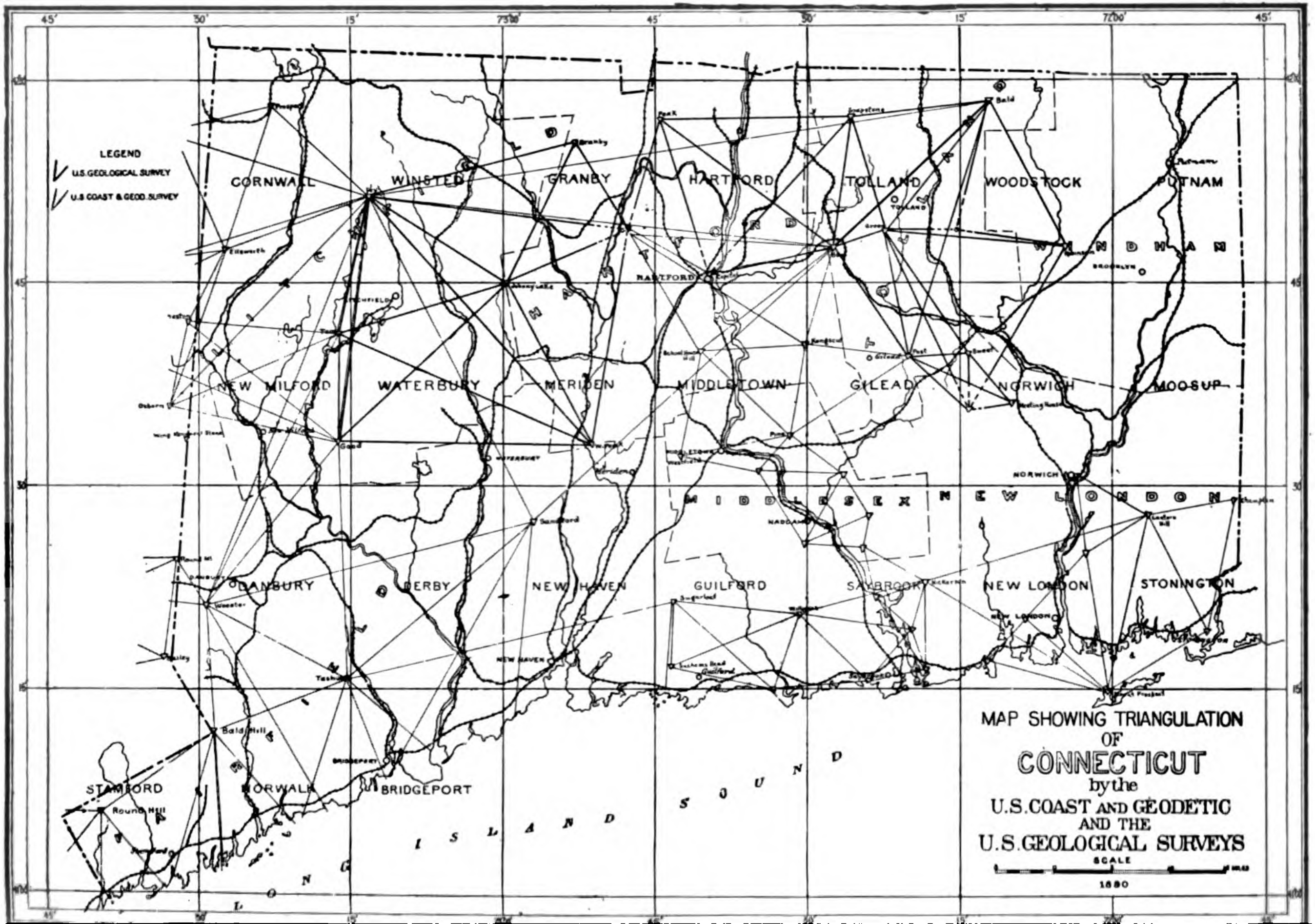
the tanks, which, for convenience, are in duplicate and side by side. Near the upper end of the tank a wooden floating gate is used to catch anything which may be on the surface of the water, as corks and the like. Low walls cross the tank at intervals, over which the liquid flows. These serve to catch and detain the settling sludge. It is obvious that the tanks are large enough in cross section to cause the liquid to flow very slowly. An open drain at the bottom of the tank receives the sludge which is pumped into vacuum pans to prevent the destruction of the pump. It is then filtered under pressure through canvas, leaving hard cakes of some commercial value. The liquor of filtration is carried off with the rest to the irrigation farm, which forms part of the system. An ingenious device, of which I show a sketch, is



used to take the supernatant liquid from the tank. A gated pipe is introduced through the side of the tank at the bottom. At the end of this pipe a swinging length of pipe is attached, which is provided with a float at its free end, so that it is always just below the surface of the water, no matter what its height in the tank. It will be seen that when the gate is opened the water will be drawn from the top of the tank and that the swinging pipe will fall with the water, so as to drain the water from the surface only. An open conduit or canal leads from the tank house to the sewage farm, where a net-work of cross channels, provided with gates, conveys the water to any desired part of the field. The infiltration is intermittent, no annoying odor is created, and a highly productive farm—chiefly in vegetables—helps to pay the cost of maintenance. The land is underdrained at five feet below the surface and the filtered, nearly pure, water is led into a brook, which empties into the Passaic river. In winter, if the earth is frozen too hard for infiltration, provision is made for further purification of the effluent water, which is then directly discharged into the brook. This system has now been in service about two and one-half years, and is, I understand, highly satisfactory in its operation.

I had intended to close my paper here, but at the risk of an anti-climax I give a brief description of the Boston sewage system, to which my attention has lately been called. A few years since it became apparent that the water front of the city was being ruined by the discharges from the city sewer mains. An intercepting sewer surrounding almost the entire city, was built to take the flow from these mains. An upper segment of each main was, however, left open, so that in the case of heavy rainfall when the sewage is most diluted, and when also the intercepting sewer is least adequate, a portion of the sewage may be directly discharged as before. From the intercepting sewer a conduit runs eastward to a pumping station, where it is raised nearly forty feet into a pair of settling tanks 1,260 feet long, 8 feet wide, and 16 feet deep. Through these the liquid flows at the rate of about 15 feet per minute and deposits its suspended matter without the assistance of any chemical reagent. Gated openings at the bottom of these tanks permit the washing out of the sludge, which is assisted by scrapers conforming to the shape of the bottom and sides of the tank, and forced along by the flow of the water when in use. The sludge, after being once more settled, is loaded into a barge, carried out to sea and dumped overboard. The effluent water is carried under Dorchester Bay, across Squantun Neck and to Moon Island, where it is held in a brick reservoir to be discharged in the Atlantic one hour after each high tide.

I have endeavored to contribute material for the discussion in which it is hoped all will join and to avoid opening the discussion by comment or criticism of the different methods. I shall, of course, be glad to answer any proper questions, following the schoolmaster's rule of distinguishing between proper and improper questions, as those which I can answer and those which I can not.



MAP SHOWING TRIANGULATION OF CONNECTICUT by the U.S. COAST AND GEODETIC AND THE U.S. GEOLOGICAL SURVEYS

The Topographical Survey of Connecticut.

BY J. H. CHAPIN, PH. D.

In the General Assembly of Connecticut for the year 1889, an act was passed providing for a Topographical Survey and map of the State; the work to be done by the United States Geological Survey, under the supervision of a Board of three Commissioners to be appointed by the Governor, and the expense to be borne jointly by the state and the general government, agreeable to an act of Congress, giving the Director of the United States Geological Survey the right to make such contracts for the sake of encouraging topographical surveys in the older states. In the territories, such work is done wholly at the expense of the general government.

The credit of originating the bill for the Connecticut Survey is due to Judge S. W. Adams of Hartford, and it was presented in the Senate, early in the session, by Hon. E. S. Cleaveland, Senator from the first district. The act was passed and received the signature of his Excellency, Governor Morgan G. Bulkeley, in June 1889; the Commission, consisting of Wm. H. Brewer of New Haven, James H. Chapin of Meriden, and John W. Bacon of Danbury, was at once appointed, and negotiations begun for the prosecution of the work.

On the tenth of July following, a conference was held at the house of Prof. Brewer in New Haven, between the Commissioners and Maj. J. W. Powell, Director of the United States Geological Survey, and Mr. Marcus Baker, Chief Geographer. In the agreement between the parties entered into at this time, it was stipulated: that the work should be done under the direction of the United States Survey, subject to the supervision of the Commissioners: that the map should be drawn on a scale of $\frac{1}{62500}$, approximately one inch to the mile: that the hypsography, or height of land above the level of the sea should be shown by contour-lines at vertical intervals of twenty feet: that the heights of important points should be determined and properly indicated: that town and county lines, as established or understood at time of the survey, should be included: that the resulting map should fully recognize the co-operation of Connecticut in the work: that, as the work progressed, photographic copies of the manuscript sheets should be furnished the Commissioners as *proofs*, and electro-copper plates of the sheets of the map when completed; all to come within the appropriation made by the legislature for the purpose.

It was subsequently further agreed, that the houses along country highways should be indicated on the map. This was a special concession to Connecticut, nothing of the kind ever having been done by the United States Survey in any other state. The map of Conneticut will therefore be more complete than any other, except where such feature may have been subsequently added by the states at their own expense.

The preliminaries having been thus agreed upon, the field work was at once begun and prosecuted with such vigor, that nearly half the state was surveyed before the winter weather compelled a suspension of operations, and the season of 1890 will see the field work nearly if not entirely completed. After that of course comes the office work, transferring, filling in and engraving, of which we shall speak further on.

The method of proceedure in the field may be briefly outlined as follows:

The work is based first of all, upon that of the United States Coast and Geodetic Survey, which is known to be generally very exact, and the somewhat widely-separated signal stations of that survey, as on Mount Carmel near New Haven, Ivy Mountain in Goshen and Box Hill in Bolton, are taken as starting points.

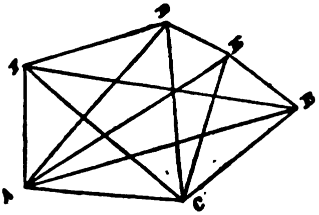
First, a party goes over the whole field, taking the work of the Coast Survey as a base, and divides the State into a series of triangles, establishing signal stations on convenient heights, and noting with much precision the exact position of each, giving latitude and longitude, together with azimuth and distances to neighboring points; but no attempt is made to determine heights, these being left for subsequent determination.

Facing page 51 is a diagram of the state as triangulated. The names in large letters are names of survey sheets. The fine lines, chiefly near the coast, indicate the sides of triangles established by the Coast Survey and the points connected by them are Coast Survey stations. The heavier lines, chiefly in the interior and northern part of the state, indicate the work done for the topographical survey,—the two together constituting the plot of the state as left by the triangulating party. This was completed in 1889.

Then comes the work of the topographer proper, leveling, plane-table work and sketching. He is to ascertain the level above the sea, to note the direction of streams and roads, to indicate woodlands, swamps, lakes, ponds and the like, and make the first sketch of the map of the district he has in hand. Mid-tide is taken as a base in calculating levels, as more reliable because less variable than either high or low tide; and the survey is made in sheets or sections covering about 220 square miles each in this latitude; or, to state the matter more exactly, covering 15 minutes of latitude and 15 minutes of longitude.*

There will be twenty sheets of Connecticut wholly within the state, besides fourteen sheets that will overlap into adjacent states, or out upon Long Island Sound. This overlapping is due to the fact that all the work of this character done by the United States Geological Survey is based upon latitude and longitude, and therefore conforms only incidentally to boundaries between the states. The edge of a sheet may or may not fall upon a state line. As the state lines are traced, however, by heavy shading, it is of no consequence so far as the map itself is concerned. That may be cut exactly to the line if desired, or may include narrow strips of adjacent territory. There are some advantages in the latter, as it shows what our contiguous neighbors are, whether land or sea.

The topographer begins by establishing upon his sheet a number of "control points," as they are termed, that is, points on prominent heights, or in open fields in the absence of convenient heights, from which the direction of neighboring points can be observed and their bearing noted.



To illustrate: Suppose the engineer to take his stand at *A*, [see diagram] with his alidade, (a telescope and spirit level mounted on a rule for convenience in moving upon the plane-table) and turns his instrument successively upon *B*, *C*, *D*, *E* and *F*, one of which may be a church steeple, another a lone tree, another a glistening rock upon a hill top, another a red barn or school house, or building with new roof or other distinguishing mark by which it may be easily identified.

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*These sheets when completed measure about 13¼ by 17½ inches each and a map of the state on this scale will be nearly eight feet long, by five and a half wide.

The direction in each case is carefully noted, together with any prominent objects by the way for future observation, and in each case, a line drawn upon the plane-table* by the straight edge of the rule while the instrument is in position, fixes the direction at once upon the sheet. This is the first step in the "graphic" method of plotting a map and is commonly used in the United States Survey.

Having noted the several directions already indicated at *A*, the operator next moves to *B*, and first "orients" his plane-table, that is, moves the table till the line drawn from *A* to *B* is exactly indicated in the opposite direction. In other words he "sights back" to *A*, and the reading in this case should be exactly the opposite of the first; that is, if the direction from *A* to *B* is east 20 degrees north, the reading from *B* to *A* must be west 20 degrees south, else there is an error in the first reading and the work must be done over. In the graphic method of plotting, however, such an error is hardly possible, since a line once drawn on the sheet with the plane-table accurately adjusted to the points of the compass, cannot be otherwise than correct. The line on the sheet perfectly represents, as to direction, a line upon the surface of the country between the two objective points.

The operator, while his instrument is adjusted as described at *B*, "takes a shot" at all the other points before he moves, indicating the direction as before; and then moves on to the other points so far as accessible, doing the same thing, and in each case may sight new objects and establish additional points. In this way the district is divided up into smaller triangles and covered with such a network of lines that it is easily transferred to the sheet that forms the first outline of the map. These lines are drawn in pencil and easily erased when no longer needed. For convenience in handling, the work in the field is usually done upon small plane-table sheets, four of which constitute an atlas sheet or survey sheet proper.

When a sufficient number of control points have been secured, and the connecting lines entered on the sheet, the roads are inserted. These may be copied first from any existing map, and any errors in such map will at once be shown by their relation to the points already established. Then follow streams, ponds and the like, with houses along country roads, the later as before stated a special concession to connecticut. The roads are generally traversed and their distances noted, though when they are straight, and pass near control points, this is hardly necessary. The distances are easily calculated if occasion requires. Then comes the sketching of the map, by which woodlands, mountains, lakes and other prominent features are indicated, and the contour lines representing heights inserted. These lines are in brown for convenience of distinction—town lines being in black and water ways in blue—and each one indicates a vertical distance or height of twenty feet, while the heavier lines in the same series indicate one hundred feet. Suppose, for example, a given hill to be one hundred feet in height; the fact will be indicated by five contour lines, and so of any other height.

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*A plane-table is defined by Webster as—"a table or board mounted on a tripod and graduated at its edge, with a movable rule to which sights are attached, used for plotting the lines of a survey on paper in the field, without the necessity of taking field notes."

Determining heights is usually done by a series of levels, starting from the sea at mid-tide, or from some known elevation. In this the railroad surveys have been of much service, though in a few cases in the state, they were not found sufficiently accurate for the purposes of the survey and special series of levels were run over the lines or along the road-beds. Where an elevation is difficult of access, the height is calculated by vertical angles, and in a few cases barometrical measurement has been used, though this method is not altogether reliable, except where several observations are made in various conditions of the atmosphere, and the mean indication adopted. The height of West Peak was taken by vertical angles from the summit of Buckwheat hill, the elevation of the latter having been taken by a series of levels from the railroad at the Main street crossing. The crossing, according to the records in the office of the railroad Company, is 133.5,* the hill is 331.5 feet higher, and the peak, 555 feet above the hill, giving a total of 1020 feet as the height of West Peak. This makes the altitude something over twenty feet more than hitherto supposed. The measurements were made with great care however, and are doubtless correct.

After the completion of the field work, which is necessarily suspended in the winter, comes the office work of transferring, filling in and lettering, which requires great care on account of the many and minute details, and occupies oftentimes as much time as that done in the field. To guard against errors, the sheets when prepared are photographed and sent to the Commissioners as proofs; the field is then traversed with a view to testing their accuracy, any errors found are reported to headquarters and all needful corrections made, before the work goes into the hands of the engraver and assumes permanent form.

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*The record reads 129 feet, but this means above average high water mark. Adding 4.5 feet for the difference between high and mid-tide, gives 133.5 feet as above.

Moreover practical geologists go rapidly over the State and indicate in outline on special sheets, the general characteristics of the surface formations. This is not strictly required by the terms of the contract, but will add a feature of much interest to the work, and may pave the way for a thorough geological resurvey a few years hence, nothing of the kind having been done for fifty years, except in small sections here and there, and generally by private enterprise. The geological survey made by Dr. James G. Percival, beginning about 1835, was accounted a meritorious work, but the changes in almost every branch of geological science within that period, render it now in good part obsolete.

The importance of this survey, as it bears on various public interests, can hardly be over-estimated. First, it is to determine the size of the State, which has never yet been known, notwithstanding Connecticut is the oldest commonwealth in existence, having a written constitution. It is to represent State, county and town boundaries; and what is of far greater practical importance, to mark the course of streams, to determine the watershed or drainage area of streams, ponds and reservoirs of different kinds, to indicate elevations and depressions, together with the character of slopes, whether abrupt or gradual; and thus make it possible to determine the probable accumulation of water, both in ordinary and extraordinary seasons; for on these conditions depend the strength of dams and similar structures necessary to withstand the pressure that may come upon them. These considerations are not generally given the importance they demand.

Disastrous floods are often due to the fact that dams or reservoirs intended to retain the accumulated waters or not of sufficient strength for the purpose. And yet it is impossible for the most competent engineer to decide upon the strength required in such cases, unless he knows very definitely both the extent and character of the drainage surface; that is, whether the slopes are abrupt or gradual and near the stream or remote from it; for upon these depend the violence of the flow and rapidity of the accumulation.

So far, then, as concerns the building of railroads, canals, reservoirs, the construction of tunnels, sewers and the like, the topographical survey is of the first importance. It concerns not only the state at large, but every community in the state, every taxpayer and every citizen.

The first thing the Commissioners attempted as the field work began, was to take measures to secure as much accuracy as possible in designating the boundaries of the towns. Of course the United States Survey cannot determine disputed town lines, even had it authority—which it has not—for this would involve the searching of voluminous records and the like. The engineers can only indicate lines as already *established* and *marked*. The attention of selectmen throughout the State was called to this important feature of the forthcoming map, the law of the State requiring town lines to be retraced at certain intervals was cited, and they were urged to see at once, that their respective town lines were properly traced and plainly marked. If, therefore, any errors of this kind appear in the completed map, it will be due to the carelessness or indifference of town officials, and not to any oversight of the Commissioners or neglect of the Engineers.

In just what shape and style the new map will be given to the public or published for general use will depend on future legislation. It may be printed directly from the plates as completed and furnished by the United States Survey, and these may be spread out as a wall map, or bound together as an atlas.

For some purposes a map on a larger scale—which could be readily drawn from the original—would be very useful, while for ready reference a similar map on a reduced scale would be more convenient. But all this must be left to the future. With a map that contains so much both of general and special interest, it matters little just what form it takes. It may be on a larger or smaller scale, according as convenience may suggest or the public demand will justify.

Some Geological Features of Meriden.

BY J. H. CHAPIN, PH. D.

The most striking geological feature of Meriden is the succession of Trap ridges that rim it on the north, and curving southward in adjacent towns, form a sort of amphitheatre in the midst of which the city stands.

It has been customary to speak of these ridges as dikes, but as there is some difference of opinion among geologists as to the precise mode of their occurence, the term is held somewhat in obeyance for the time.

West Peak,* the most elevated portion of the Trap formation, and the highest point of land in Southern Connecticut, according to recent measurement for the Topographical Survey, is 1020 feet. A subordinate spur which advances further to the front, but has a less altitude, and is separated from the first by a short sharp notch, has sometimes been called East Peak, while the eastern section of the mountain has been termed Reservoir Mountain, as the reservoir which supplies the city with water, is on the eastern flank. But there seems to be no sufficient reason for the last two designations, and the use of the names should be discontinued, unless it be for mere local convenience. If a more comprehensive term than West Peak is desired for the whole uplift west of the reservoir, West Mountain may be admissable. East of the reservoir and extending to Cat Hole Pass is South Mountain, one of the most massive of the whole series, with an altitude of 780 feet. The terms Notch Mountain and Hanging Mountain have also been applied to this, but neither of them can be considered authentic.

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*The rules adopted by the United States Board on Geographic Names has been followed in this article, namely:

1. The spelling and pronunciation which is sanctioned by local usage, should in general be adopted.

2. Where names have been changed or corrupted, and such change or corruption has became established by local usage, it is not in general advisable to attempt to restore the original form.

Immediately east of the narrow pass having the same name, is CAT HOLE MOUNTAIN, a very sharply defined peak with a lower ridge three quarters of a mile east, which has been extensively quarried, and affords several interesting exposures of the formations. Poetry assisted by the imagination, finds occasion to substitute the more dignified title of *Washington Profile* for *Cat Hole Mountain:* but the facts in the case will hardly warrant the change. The whole group from, and including West Peak and Cat Hole are sometimes known as the "Hanging Hills." About two miles still further eastward and beyond the considerable valley traversed by the New York, New Haven & Hartford Railroad, is MOUNT LAMENTATION, a ponderous uplift extending three miles to the northward, and having an elevation at the highest point of 760 feet. A semi-detached portion of Lamentation at the south east extremity, is known to the old inhabitants as CHAUNCY HALL PEAK. Here the range veers sharply to the south through Westfield and Middletown, Middlefield and Durham, and so on to Long Island Sound. The several peaks or rather sections of the range are, HIGBY MOUNTAIN, extending to the Meriden and Middletown turnpike; BESECK MOUNTAIN, reaching from the turnpike to Reed's Gap through which the Air Line Railroad passes, and TREMONT MOUNTAIN, so named by Percival because of the peculiar conformation of the summit, still further to the south, but in full view from any elevated point in Meriden.*

A feature of much interest in Meriden, and evidently connected in some way with the great exhibition of eruptive rock is the ash-bed, with volcanic bombs, that is found on the western slope of Lamentation Mountain, or rather in the anterior ridge of *trap*, adjacent to the mountain. It lies in the "Berlin Woods," about forty rods east of the Meriden and Berlin road and two miles north of the city.

Just where this mass of ash and great, rounded blocks of seared and now, much weathered *trap* came from, that is, from what particular vent, is uncertain. It is unquestionably of volcanic origin, and came from the interior of the earth; but the precise point of exit has not been determined. The vent may have been filled long since with detritus, overlaid with soil and covered with vegetation. It may have been at the bottom of the neighboring peat bog, or it may still be hidden away in some unsuspected nook and masked by the growth of vines and stunted evergreens. Traces of volcanic ash occur at other points in the *trap* range, but none of so pronounced character as that in the Berlin woods.

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*The name, Beseck Mountain was applied a hundred years ago to a large hill, east of the north end of Higby, as existing land titles show, but the name has fallen into disuse in that connection, and been, by general consent, transferred to the section above described, that is the mountain lying east and south of Black Pond.

Another feature of special interest at this time, because never before particularly described, is the *Esker* or *Serpent Kame*, toward the east part of the town, a very distinctly marked ridge of washed gravel of undoubted glacial origin.

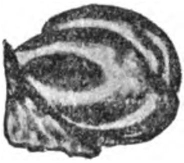
It is easiest reached by following the Middletown turnpike as far as Willow hill, then turning south and passing Misery swamp. The ridge begins to develop five rods south of the swamp on the premises of Mr. Kuhns, and the character of the formation is sufficiently revealed by a glance at the field immediately south of his house. It is made up of gravel, soil and sand, with the balance in favor of the gravel, though the stoney layers have, of course, been thrown out of position by the plow.

It extends southward, by a slightly winding course, like the track of a serpent—whence the name—for about one mile, to the premises of Mr. Roland Ives, where it is merged into a broader sheet of gravel not so distinctly marked. The ridge, through the greater part of its course, is from three to eight rods wide and from five to twelve feet high, though near the southern extremity it rises somewhat higher above the general level. About mid-way, or perhaps a little further south, it crosses a swamp, cutting it in two and apparently damming up a stream that once flowed from the hills on the west into the outlet of Foster's pond. The ridge is now covered with a growth of birch and scrubly oaks, apparently a second growth, the original having been long since cut away.

The writer's attention was called to this peculiar feature of the surface geology of the town by Mr. J. B. Woodworth, an assistant of Prof. N. S. Shaler, of the United States Geological Survey, in the summer of 1890, and an examination, later in the season, revealed the character of the formation as a veritable glacial product, the gravel and cobble stones, some of them bearing glacial striæ, lying flat in the ridge and the whole having a rude stratification.

Last, but perhaps not least, of the recently observed geological features of Meriden is an exposure on Camp street in this city, about twenty rods east of the iron bridge, over the railroad. The exposure was made in digging for the foundation of a carriage shed, and shows a varied mixture of clay and sand, the latter lying in thin layers and broken into two or three fragments, apparently by some disturbance of the strata and all pushed together in a rather promiscuous heap. It occurs in a ridge or rounded prominence supposed to be of glacial drift and overlying a nucleus of sand stone forming the bed rock. The occurrence of boulders imbedded in sand and traces of boulder clay a little to the eastward leaves little room to doubt the origin of the ridge, but the later movement, by which the strata were thrown out of position, contorted, ruptured, faulted and pushed together is not so clear.

There is a possible suggestion of the returning glacier after the interglacial epoch—if there was such an epoch in this latitude—as the disturbing agent, but the whole matter awaits further investigation.



Cycadinocarpus Chapinii.

In the second volume of the "TRANSACTIONS OF THE MERIDEN SCIENTIFIC ASSOCIATION," January, 1886, announcement was made of the discovery of a new fossil plant, briefly described as "a species of *Cycad*," * * * * "having a rounded base and being pointed at the other extremity, with a structure more nearly resembling a bud than a well-defined nut." It was found by Mr. H. H. Kendrick, a member of the Association, in the Durham shales, the same as have yielded so many specimens of the Triassic *fauna*. The announcement attracted the attention of the Bureau of Paleontology connected with the United States Geological Survey, and by request the specimen was forwarded to the department for more critical examination. It was found to represent a species never before described, and in due time was returned to the Association labeled as above, it being the custom of the department to name a species after the person who first gave a description to the public. The cut is natural size and fairly represents the specimen. It is described by Dr. J. S. Newbury—Monographs of the United States Geological Survey, Vol. XIV., Fossil Fishes and Fossil Plants of the Triassie Rocks—as "plainly the fruit of a Cycad, and perhaps of *Otozamites latior*, which is quite common at the locality where it was found. It probably consisted originally of a hard, ovoid, compressed nucleus, surrounded by a sarcocarp, covered with a leathery rind. When compressed in fossilization the nut is shown in relief, and the envelope forms the margin about it. A large number of Cycad fruits are known but there is none described with which I have been able to identify this." The specimen is now in the possession of Mrs. E. B. Kendrick of Meriden.

J. H. C.

The Pre-Columbian Discovery of America by the Northmen.

BY CHAS. H. S. DAVIS, M. D.

The approaching celebration of the four hundredth anniversary of the alleged discoverey of America by Columbus, has led me to state some of the facts which prove conclusively that America was not discovered by Columbus. And while we can admire the energy of Columbus in defying prejudices, and overcoming difficulties and obstacles, yet the facts of history should be stated correctly. As Darwin says: "False facts are highly injurious to the progress of science, for they often long endure; but false views, if supported by some evidence, do little harm, as everyone takes a salutary pleasure in proving their falseness; and when this is done, one path towards error is closed, and the truth is often at the same timed opened."

It is known that the discovery of America by the Northmen was committed to writing at a known date, viz. between 1387 and 1395, in a manuscript of unquestioned authenticity, and now in existence, and that this known date was eighty years before Columbus visited Iceland to obtain nautical information, viz. in 1477, when he must have heard of this written account of Vinland; as it was not until 1492 that he came to America. There may have been European navagators on the east coast of North America before the time of the Northmen; but of this we have only vague traditions and uncertain rumors. The first well-ascertained expeditions from Europe to this country were made by the Northmen, or Scandinavians, near the end of the tenth, and beginning of the eleventh centuries. The documents relating to these voyages are for the most part preserved in the well written annals of Iceland. In 1837, there was published at Copenhagen by the Royal Society of Northern Antiquaries, a work of great literary labor and extensive reserch, * by Professor Rafn, which clearly shows that the eastern

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*Antiquitates Americanæ, sive Scriptores Septentrionales Anti-Columbianarum in America.

coast of North America was discovered and colonized by the Northmen more than five hundred years before the reported discovery of Columbus. These facts rest upon the authority of ancient Icelandic manuscripts, preserved in the Royal and University Libraries of Copenhagen. Fac-similes of the most important of these documents are given in Professor Rafn's work, together with maps and delineations of ancient monuments illustrative of the subject; a Danish and Latin translation follows the Icelandic text, and the whole is accompanied by introductory observations, philological and historical remarks, as well as archæological and geographical disquisitions of high interest and value. Although Torfaeus, the learned historian of Norway, * published an account thereof and besides him, Suhm, the Danish historian, Schœning, Lagerbring, the Swedish historians, Wormskjold and Schrœder, to say nothing of many others, have all presented the main facts in their historical work, it was not until Professor Rafn's work was published that scholars outside of Scandinavia could be induced to examine the claims of the Norsemen.

The Icelandic recods show conclusively that after the discovery of North America in the tenth century, the Norsemen repeatedly visited this country in the eleventh, twelfth, thirteenth and fourteenth centuries, but that Christianity had been introduced in America not only among the Norsemen, who had formed a settlement here, but also among the Aborigines, or native population, that the Norsemen found here. The Norsemen were the descendants of a branch of the Gothic race that, in early time emigrated from Asia, and traveled westward and northward, finally settling down in what is now the kingdom of Denmark. Their language was the old Norse or Danish, (Donsk Tunga), once spoken all over the north, but which is now preserved in Iceland alone, being called the Icelandic or Old North, upon which is founded the modern Swedish, Danish, and Norse or Norwegian. The Norse-

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*Orcades, seu rerum Orcadensium Historiae, 1697.

NOTE.—Since this article was written there has been published "The Finding of Wineland the Good, The History of the Icelandic Discovery of America," edited and translated from the earliest records by Arthur Middleton Reeves, Oxford, 1890. In this quarto volume of two hundred pages, Mr. Reeves presents all of the sagas bearing upon the finding of Vineland, or "Vineland the Good," and gives photographic illustrations of the Icelandic texts from plates made in Copenhagen. The historians and students of America have now before them in fac-simile, all of the evidence on which the claims rest that America was discovered before the day of Columbus, by Icelanders colonizing Greenland.

men were most daring adventurers. They made themselves known in every part of the civilized world by their daring as navigators. In their conquering expeditions they subdued a large portion of England, worsted Normandy, the finest province of France, from the French King, conquered a considerable portion of Belgium, and made extensive inroads into Spain. Under Robert Guiscard they made themselves masters of Sicily and lower Italy in the eleventh century, and maintained their power there for a long time. During the crusades they led the van of the chivalry of Europe in rescuing the Holy Sepulchre, and ruled over Antioch and Tiberias under Harald. They passed between the pillars of Hercules, they desolated the classic fields of Greece and penetrated the walls of Constantinople.*

In the year 860, a Dane of Swedish descent named Garthar Svafarsson, commanded a ship which was bound for the Hebrides, but which was driven by storms until it came in sight of Iceland, and sailed around it, and wintered on the east shore of Skjalfandi bay, and four years later, Naddod, a Scandinavian, called the sea-king, came in sight of the island and called it snowland (Snjaland). The good news which they brought home from it induced others to follow them back, and in 875, the Northman, Ingolf, approached the coast and threw overboard his seat-posts.†

Iceland occupies an area of about forty thousand square miles, affording the dull diversity of valleys without verdure and mountains without trees. Desolation has there fixed its abode. It broods among the dells, and looks down upon the gloomy fiords. The country is threaded with streams and dotted with tarns, yet the geologist finds but little evidence in the structure of the earth to point to the action of water. On the other hand, every rock and hillside is covered with signs to prove their igneous origin, and indicate that the entire island, at some distant period, already seethed and bubbled in the fervent heat. Even now the ground trembles in the throes of the earthquake, the geyser spouts scalding water, and the plain belches mud; while the great jokul (Mount Hecla), clad in white robes of eternal snow—true priest of Ormuzd—brandishes aloft its volcanic torch, and threatens to be the incendiary of the sky. The greater portion of the land forms the homestead of the reindeer and the fox, who share their domain with the occasional white bear that may float over from Greenland on some berg. Only two quadrupeds, the fox and the moose, are indigenous. Life is here purchased with a struggle. Indeed, the neighboring ocean is more hospitable than the dry land, for of the thirty-four species of mammalia twenty-four find their food in the roaring main. The same is true of the feathered tribes, fifty-four out of ninety being water fowl. Here and there may be seen patches of meadow and a few sheep pastures and tracts of arable land warmed into fruitfulness by the brief summer's sun; yet, on the whole, so pure is the soil that man, like the lower orders, must eke out a scanty subsistence by resorting to the sea.* It was towards this land, which the settlers called *Ice*land, that the proud Norwegian jarl turned his eyes, and there he resolved to found a home, because there he could be *free*. The affairs in Norway gradually became such, under the imperious sway of Harold Harfagr (the fair-haired), that the proud jarls would not submit to be deprived of their ancient feudal rights, and feeling themselves degraded in the eyes of their retainers, they resolved to leave those lands and homes which they could now hardly call their own, and seek safety and independence in Iceland. But its remote position rendered the voyage thither both difficult and dangerous; not only amongst hundreds of fugitives, scarcely the chiefs themselves, who possessed large ships, could provide the necessary outfit for a voyage, which often lasted for half the year; and the colonization of the new country was necessarily slow and progressive, and confined, at first, to the more wealthy chieftains of the western coast. But the intelligence was soon spread abroad that brave and daring men had established themselves in a new country, where the cattle could provide for themselves in winter, and where the waters were full of fish; and many, therefore, determined upon removing to this favored region. The tide of emigration from Norway progressively increased, and soon became so great, that Harold, fearing that his kingdom would, eventually, be left desolate, prohibited it altogether, and laid a tax upon every voyager to Iceland. The chiefs took their families, servants, slaves, and cattle; and many kinsmen and relatives, who were accustomed to follow the fortunes of the chief, accompanied him also on this new venture. In the course of sixty years, the whole island had become thus colonized.* It was not long before the population of Iceland was upward of 50,000. The Norsemen on their arrival in Iceland did not find this barren country entirely destitute of human beings. This Island had been visited by Pytheas 340 years before Christ; and according to the Irish monk Dicuilus,† who wrote a geography in the year 825, it had been visited by some Irish priests in the summer of 795. The monks who had come hither from Ireland and the Isles of Iona, to be alone with God, all took their departure on the arrival of the heathen followers of Odin and Thor, and the Northmen were left in undisputed possession of the soil. Among no other people of Europe can the conception and birth of historical literature be more clearly traced, than amongst the people of Iceland. Here it can be shown how memory took root, and gave birth to narrative; how narrative multiplied and increased until it was committed to writing; how the written relation became eventually sifted and arranged in chronological order, until at length, in the course of time, the breath which had given life and character to the whole, fled hence, and only the dead letter remained.‡

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*Historical Sketch of the Discovery of America by the Norsemen, by R. B. Anderson, page 25. Chicago, 1874.

†Ondvegissulur, or Stetstakkar. These were tall carved wooden pillars, attached to the seat of the chief, and ornamented at the top with the figures of his tutelary deities, generally Thor or Odin. In selecting a place for a settlement these were flung overboard, and whenever they were thrown upon the beach there the settlement was to be formed. The superstitious preference given to that particular part of the coast, upon which they happened to be cast was so great, that Ingolf, after a residence of three years at Ingolfshofdi, where he first landed, removed to the unfavorable situation of the present capital, Reykjavik, on finding that his seat-posts had drifted to that point— (*Antiq Amer*, page 9, note a.)—and formed the first permanent settlement,

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* Pre-Columbian Discovery of America by the Northmen, by B. F. De Costa, p. 32, Albany, 1868.

The heroic exploits and great undertakings of the Northmen in Iceland, called into existence among them many enthusiastic and talented literary and scientific men, who strove to praise and to describe their exploits in writing, and the ancient literature and traditions of Iceland excel anything of this kind in Europe during the middle ages.|| Through the long winters, when the sun nearly or entirely disappeared from above the horizon, and nothing but northern lights flickered over their heads, the inhabitants of Iceland seemed only the more thrown upon their intellectual resources, and passed the time in reciting the Eddas and Sagas of their ancestors.

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* The Discovery of America by the Northmen, by N. L. Beamish, p. v. London, 1841.

† De Mensura Orbis Terræ, ed. Latronne, p. 38.

‡ Beamish, op. cit. p. 11.

|| The Landnamabok records the colonization of Iceland from 870 to 930; the Sturlunga Saga contains its history from 1100 to 1264; its church history is found in the Kristin Saga and in the Biskupa Sogur, or lives of the bishops of Iceland.

DISCOVERY OF GREENLAND.

The discovery of Greenland was a natural consequence of the settlement of Iceland. Between the western part of Iceland and the eastern part of Greenland there is a distance of only 160 geographical miles. In the year 877 a northeast storm drove one of the Icelandic settlers called Gunnbjorn near the coast of Greenland, but he did not land. The report of his discovery seems to have been pretty well circulated upon his return to Iceland, and it was for nearly a century that the "Country of Gunnbjorn" (Greenland), existed only in tradition. All that we know of Gunnbjorn is to be found in a few lines in the *Landnama*,* which gives us the earliest information on record in regard to the westward movements of the Icelanders. "There was a man named Grimkel [A. D. 876], son of Ulf Hreidarson, called Krage, and brother of Gunnibiorn, after whom Gunnibiorn's Rocks† are named." "Two sons of Gunnibiorn, Ulf Krage's son, after whom Gunnibiorn's Rocks were named, were called Gunstein and Haldor." About a century after the discovery of Greenland by Gunnbjorn, Erik the Red, who had fled from Jaedern, in Norway, on account of manslaughter, settled in the western part of Iceland. Here he was also outlawed for manslaughter, by the public assembly, and condemned to banishment. He therefore fitted out a ship, and resolved to go in search of the land in the west that Gunnbjorn and others had seen. He set sail in the year 984, and found the land as he expected, and remained there exploring the country for three years. At the end of this period he returned to Iceland, giving the newly discovered land the name of Greenland, in order, as he said, to attract settlers, who would be favorably impressed by so pleasing a name. The summer after his return to Iceland, he sailed once more for Greenland, taking with him a fleet of thirty-five ships, only fourteen of which reached their destination, the rest being either driven back or lost. This event took place, as the Saga says, fifteen winters before the introduction of Christianity into Iceland, which we know was accomplished in the year A. D. 1000. The date of Erik's second voyage must, therefore, be set down at 985. The following Saga or narrative of Erik the Red, the first settler in Greenland, forms part of the celebrated Flatobagen or Codex Flatoiensis.*

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* *The Landnama-bok.* This is probably the most complete record of the kind ever made by any nation. It is of the same general character as the English *Doomsday Book*, but vastly superior in interest and value. It contains the names of three thousand persons and one thousand four hundred places. It gives a correct account of genealogies of the first settlers, with brief notices of their achievements. It was commenced by the celebrated Frode, the Wise, who was born 1067, and died 1148, and was continued by Kallstegg, Styrmer and Thorsden, and completed by Havk Erlendson, Governor of Iceland, who died in the year 1334.

† Torfœus says that these rocks lie six sea miles out from Geirfuglesker, out from Reikiavek, and twelve miles south of Garde in Greenland, yet they cannot now be found. The probability is that these rocks have been sunk by some of those fearful convulsions which have taken place in Iceland.

SAGA OF ERIK THE RED—DISCOVERY AND COLONIZATION OF GREENLAND, A. D., 985.

Thorvald hight, a man, a son of Osvald, a son of Ulf-Oxne-Thorersson. Thorvald and his son, Erik the Red, removed from Jæder to Iceland, in consequence of murder. At that time was Iceland colonized wide around. They lived at Drange on Hornstrand; there died Thorvald. Erik then married Thorhild, daughter of Jærunda and Thorbjorg Knarrarbringa, who afterwards married Thorbjorn of Haukadal. Then went Erik northward, and lived at Erikstad near Vatshorn. The son of Erik and Thorhild hight Leif. But after Eyulf Soers and Rafn the duelist's murder, was Erik banished from Haukadal, and he removed westwards to Breidafjord, and lived at Oexney at Eriksad. He lent Thorgest his seat-posts, and could not get them back again; he then demanded them; upon this arose disputes and frays between him and Thorgest, as is told in Erik's saga.† Styr Thorgrimson, Eyulf of Svinœ, and the sons of Brand of Alptafjord, and Thorbjorn Vifilson assisted Erik in this matter, but the sons of Thorgeller of Hitardal stood by the Thorgestlingers. Erik was declared outlawed by the Thorsnesthing,‡ and he then made ready his ship in Erik's creek, and when he was ready, Styr and the others followed him out past the islands. Erik told him that he intended to go in search of the land, which Ulf Krages' son Gunnbjorn saw, when he was driven out to the westward in the sea, the time when he found the rocks of Gunnbjorn. He said he would come back to his friends if he found the land. Erik sailed out from Snæfellsjokull; || he found land, and came in from the sea to the place which he called Midjokul; it is now hight Blaserkr. He then went southwards to see whether it was there habitable land. The first winter he was at Eriksey, nearly in the middle of the eastern settlement; the spring after repaired he to Eriksfjord, and took up there his abode. He removed in summer to the western settlement, and gave to many places names. He was the second winter at Holm, in Hrafnsgnipa, but the third

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*The book of Flat Island, so called from having been found in the monastery on the island of Flato. It is a vellum manuscript containing copies of a number of Sagas, executed between 1387 and 1395, and is preserved in the Royal Library of Copenhagen. A fac-simile of this manuscript is appended to Prof. Rafn's *Antiquitates Americanæ*.

†Supposed to be a lost Icelandic manuscript.

‡Court.

|| *Jokul* is used to describe a mountain of snow or ice (glacier) from *Jaki*, a fragment of ice.

summer went he to Iceland, and came with his ship into Breidafjord. He called the land which he had found Greenland, because, quoth he, "people will be attracted thither, if the land has a good name." Erik was in Iceland for the winter, but the summer after, went he to colonize the land; he dwelt at Brattahlid in Eriksfjord. Informed people say that the same summer Erik the Red went to colonize Greenland, thirty-five ships sailed from Breidafjord and Borgafjord, but only fourteen arrived; some were driven back, and others were lost. This was fifteen winters before Christianity was established by law in Iceland. The following men who went out with Erik, took land in Greenland: Herjulf took Herjulfsfjord (he lived at Herjulfsness), Ketil Ketilsfjord, Rafn Rafnsfjord, Sœlve Sœlvedal, Helge Thorbrandsson Alptefjord, Thorbjornglora Siglefjord, Einar Einarsfjord, Hafgrim Hafgrimsfjord and Vatnahverf, Arnlang Arnlangsfjord, but some went to the western settlement.

VOYAGE OF BJARNE HERJULFSON, AND THE FIRST DISCOVERY OF NEW ENGLAND, 990.

When Erik the Red moved to Greenland, he had among his followers, an Icelander named Herjulf. Herjulf had a son by name Bjarne, who was a man of enterprise and fond of going abroad, and who possessed a merchant ship, with which he gathered wealth and reputation. Returning to Iceland in 990 from a trading voyage to Norway, and finding that his father, with Eric the Red, had gone to the west, he immediately, without unloading his ship, resolved to follow him and to spend the next winter with him in Greenland. Of this voyage we have two versions. The first is a passage from the Codex Flatoiensis given in *Antiquitates Americanæ*, p. 17, and the second is an account in *Gronland's Historiske Mindesmærker.* They boldly set sail to the southwest, but having encountered northerly storms, after many days sail they lost their course, and when the weather cleared, they descried land, not, however, like that described to them as "Greenland." They saw that it was a much more southern land and covered with forests. It not being the intention of Bjarne to explore new countries, but only to find the residence of his father in Greenland, he improved a southwest wind, and turned to the northeast, and put himself on the track for Greenland. After several days sailing, during which he discovered and sailed by other well-wooded lands lying on his left, some high and mountainous, and bordered by icebergs, he reached Heriulfsnas, the residence of his father in Greenland. His entire passage occupied nine days, and he speaks of three distinct tracts of land, along which he coasted, one of which he supposed to have been a large island. That Bjarne, on this voyage, must have seen some part of the American east coast, is clear from his having been driven that way from Iceland by northerly gales. We cannot determine with any certainty what part of our coast he sighted, and what was the northern extent of his cruise. But, taking into consideration all circumstances and statements of the report, it appears probable that it was part of the coast of New England, and perhaps Cape Cod, which stands far out to the east. One day and night's sailing with a favorable wind, was, in Iceland and Norway, reckoned to be about the distance of thirty German* miles. Two days and "nights" therefore, would be sixty German miles, and this is about the distance from Cape Cod in New England to Cape Sable in Nova Scotia. The second country seen by Bjarne would, then, probably have been Nova Scotia. The distance from Nova Scotia to Newfoundland is about three days sail; and from Newfoundland to the southern part of Greenland, a Northman navigator, with fresh breezes, might easily sail in four days, and thus Newfoundland was probably the third country discovered by Bjarne. The results of the expedition of Bjarne may be stated to have been these: He was the first European who saw, although from a distance and very cursorily, some parts of the coasts of New England, Nova Scotia, and New Foundland. He also probably crossed the Gulf of Maine, without stopping, however, to explore its waters, or giving them names.† It may, perhaps, be urged in disparagement of these discoveries, that they were *accidental*, that Bjarne Herjulfson was out in search of Greenland, and fell in with the eastern coast of North America; but so it was, also, with Columbus. The sanguine and skillful Genoese navigator, set sail in quest of Asia, and discovered the West Indies; and when in his last voyage, he did reach the eastern shore of Central America, he still believed it to be Asia, and continued under that impression to the day of his death.

LEIF ERIKSON'S VOYAGE AND SETTLEMENT OF NEW ENGLAND.‡ 1000.

When Bjarne visited Norway a few years later, and told of his adventure, he was censured in strong terms by Jarl Erik|| and others, because he had manifested so little interest that he had not even gone ashore and explored these lands, and because he could

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*The German mile a little exceeds four English miles.

†Collections of Maine Historical Society, vol. 1, p. 62.

‡This voyage is recorded in the *Flato Manuscript* and is given in *Antiquitates Americanæ*, pp. 26-40.

||Erik, Jarl (Earl) of Norway. This is supposed by Rafn to have happened in the year 994. *Antiquitates Americanæ*, p. 22.

give no more definite account of them. In Greenland, too, whither he soon returned, there was also much talk about undertaking a voyage of discovery to the southwest. Leif, a son of Erik Red of Brattahlid, went over* to Bjarne Herjulfson, and bought the ship from him, and manned the vessel, so that in all there were thirty-five men on board. Leif begged his father Eric to go as commander of the expedition, but he excused himself, saying he was getting old, and not so able as formerly to undergo the hardship of a sea voyage. Leif insisted that he among all their relations was the most likely to have good luck on such an expedition; and Eric consented, and rode from home with Leif, when they had got all ready for sea; but when they were coming near to the ship, the horse which Erik was riding, stumbled, and he fell from his horse† and hurt his foot. "It is destined," said Erik, "that I should never discover more lands than this of Greenland, on which we live; and now we must not run hastily into this adventure." Eric accordingly returned home to Brattahlid, but Leif, with his comrades, in all thirty-five men, rigged out their vessel. There was a man from the south country‡ called Tyrker, with the expedition. They put the ship in order and put to sea when they were ready. They first came to the land which Bjarne had last discovered, sailed up to it, cast anchor, put out a boat and went on shore; but there was no grass to be seen. There were large snowy mountains up the country; but all the way from the sea up to these snowy ridges, the land was one field of snow, and it appeared to them a country of no advantages. Leif said: "It shall not be said of us, as it was of Bjarne, that we did not come upon the land; for I will give the country a name, and call it Helluland."|| Then they went on board again and put to sea, and found another land. They sailed in toward it, put out a boat, and landed. The country was flat, and overgrown with wood; and the strand far around consisted of a white sand,§ and low toward the sea.¶ Then Lief said: "we shall give this land a name,

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*He must have gone over to Greenland from Norway.

†Geologists find evidence that at one period, a highly tropical climate must have existed in the northern regions. Horses could not now be kept in Greenland without great expense.

‡Sudrmadr, supposed to mean a German, as the terms Sudrmenn and Thydver skirmenn are used promiscuously to distinguish the nations of Germany, by old northern writers. *Antiquitates Americanæ*, p. 28, note a.

||Helluland, from *Hella*, a flat stone, an abundance of which may be found in Labrador and the region round about.

§Sandar Hvitir.

¶Osæbratt.

according to its kind, and called it Markland." Then they hastened on board, and put to sea again with the wind from the northeast, and were out for two days and made land. They sailed toward it, and came to an island* which lay on the north side of the land, where they disembarked to wait for good weather. There was dew upon the grass, and having accidently gotten some of the dew upon their hands and put it in their mouths, they thought that they had never tasted anything so sweet as it was. Then they went on board and sailed into a sound† that was between the island and a ness (cape) that went out northward from the land, and sailed westward past the ness. There was a very shallow‡ water in ebb tide, so that their ship lay dry; and there was a long way between their ship and the water. They were so desirous to get to the land, that they would not wait till their ship floated, but ran to the land, to a place where a river comes out of a lake. As soon as their ship was afloat they took the boats, rowed to the ship, towed her up the river,‖ and from thence into the lake,§ where they cast anchor, and brought ashore their skin cots,¶ and made their booths.†† They resolved to put things in order for wintering there, and they erected a large house.†‡ They did not want for salmon,* both in the river and in the lake, and they thought the salmon larger than they had ever seen before. The country appeared to them of so good a kind, that it would not be necessary to gather fodder for the cattle for winter. There was no frost in winter,† and the grass was not much withered. Day and night were more equal than in Greenland and Iceland, for on the shortest day the sun was above the horizon from half-past seven in the forenoon till half-past four in the afternoon.‡

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*This island has given the interpreters considerable trouble, from the fact that it is said to lie to the northward of the land. In early times an island existed northward from Nantucket, on the opposite coast of Cape Cod. This island, together with a long point of land which now has also disappeared, existed in the time of Gosnold, who sailed around Cape Cod in 1602. Capt. John Smith, in 1614, calls it "Isle Nawset." For a fuller knowledge of this island, see New England Historical and General Register, vol. xviii, p. 37, and Massachusetts Historical Collections, vol. viii, series iii, pp. 72-93.

†This sound may have been the water between Point Gilbert and Isle Nauset.

‡Grunnsæ fui mikit.

‖The river was evidently Seaconnet passage and Pocasset river.

§This lake is Mount Hope Bay.

¶ *Hudfot*, from *hud*, skin, and *fot*, a case or covering, being, strictly speaking, a skin bag or pouch, in which the ancients were accustomed to keep their clothes and other articles on a journey: the same was used for a bed on shipboard, as appears from the Laxdæla Saga, p. 116, where Thurid says: "Hun gekk at hudfati, pyi, er Geirmundr svafi"—"She went to the couch, where Geirmund slept." It thus answers to the *uter* of the Romans and Stromatodesmo of the Greeks. *Antiq. Amer.* p. 31.

††Budir. f. plu. of buo, from bua, to remain or inhabit, hence, probably, the English booth.

†‡Hus mikil.

Now, when they were ready with their house building [A. D., 1001], Leif said to his fellow-travellers: "Now I will divide the crew into two divisions, and explore the country. Half shall stay at home and do the work, and the other half shall search the land; but so that they do not go farther than they can come back in the evening, and that they do not wander from each other." This they continued to do for some time. Leif changed about, sometimes with them, and sometimes with those at home. Leif was a stout and strong man, and of manly appearance; and was, besides, a prudent and sagacious man in all respects. It happened one evening that a man of the party was missing; and it was the south country man, Tyrker. Leif was very sorry for this, because Tyrker had long been in his father's house, and he loved Tyrker in his childhood. Leif blamed his comrades very much, and proposed to go with twelve men on an expedition to find him; but they had only gone a short way from the station when Tyrker came to meet them, and he was joyfully received. Leif soon perceived that his foster father* was quite merry.† Tyrker had a high forehead, sharp eyes, with a small face, and was little in size, and ugly; but was very dexterous in all feats. Leif said to him: "Why art thou so late, my foster father? and why didst thou leave thy comrades?" He spoke at first in German,‡ rolled his eyes and knit his brows; but they could not make out what he was saying. After a while, and some delay, he said in Norse:‖ "I did not go much further than they; and yet I have something altogether new to relate, for I found vines and grapes." Is that true, my foster-father?" said Leif. "Yes, true it is," answered he, "for I was born where there was no scarcity of grapes." Now, they slept all night, and the next morning Leif said to his men: "Now we shall have two occupations to attend to, and day about; namely, to gather grapes or cut vines, and to fell wood in the forest to lade our vessel." And this advice was followed. It is related that their stern boat was filled with grapes, and then a cargo of wood was hewn for the vessel. Towards spring they made ready and sailed away, and Leif gave the country a name from its products, and called it Vinland. They now sailed into the open sea and had a fair wind until they came in sight of Greenland and the lands below the ice mountains.§ Then a man put in a word and said to Leif: "Why do you steer so close upon the wind?" Leif replied: "I mind my helm and attend to other things, too; do you notice anything?" They said that they saw nothing remarkable. "I do not know," said Leif, "whether I see a ship or a rock." Then they looked and saw that it was a rock. But he saw so much better than they, that he discovered men upon the rock. "Now I will," said Leif, "that we hold to the wind, that we may come up to them if they should need help; and if they should not be friendly inclined, it is in our power to do as they please and not their's." Now they sailed under the rock, lowered their sails, cast anchor, and put out another small boat which they had with them. Then Tyrker asked who their leader was. He said his name was Thorer, and said he was a Northman.* "But what is your name?" said he. Leif told his name. "Are you the son of Eric the Red of Brattahlid?" he asked. Leif said that was so. "Now I will," said Leif, "take ye and all on board my ship, and as much of the goods as my ship will store." They took up this offer, and sailed away to Ericfiord with the cargo, and from thence to Brattahlid, where they unloaded the ship. Leif offered Thorer and his wife, Gudrid, and three others, lodging with himself, and offered lodging elsewhere for the rest of the people, both of Thorer's crew and his own. Leif took fifteen men from the rock, and thereafter was called Leif the Lucky. After that Leif advanced greatly in wealth and consideration. That winter, sickness came among Thorer's people, and he himself, and a great part of his crew, died. The same winter Eric the Red died. This expedition to Vinland was much talked of, and Leif's brother, Thorvald, thought that the country had not been explored enough in different places. Then Leif said to Thorvald: "You may go, brother, in my ship to Vinland if you like; but I will first send the ship for the timber which Thorer left upon the rock." And so it was done.

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* Salmon were formerly so plentiful in this vicinity, that it is said a rule was made, providing that masters should not oblige their apprentices to eat this fish more than twice a week. *Antiq. Amer.* p. 435, note b.

† This is an exaggeration, or, possibly, the writer, who was not with the expedition, meant to convey the idea that there was no frost, compared with what was experienced in Greenland and Iceland.

‡ Sol hafdi dar eyktarstad ok dagmalastad um skamdegi. This date fixes the latitude of the place, according to Professor Bugge, of the University of Copenhagen, at 42° 20"—the latitude of Boston. Says Professor E. N. Horsford: "Leif's house, the site of which I predicted more than a year before I thought to look for remains of the house, was in 42° 22' 22". The Vineland of Leif's time was the place of early settlement of the Northmen—as the region of Norumbega was, later, the province of the Northmen. The site of Leif's house and the site of Norumbega were scarcely three miles apart." Professor Horsford thinks that Leif Erikson landed first at Cape Cod and then came to Boston Harbor; ran aground on an ebb tide, and with the flood tide floated up the Charles to the first convenient landing place, and built his house near the Cambridge City Hospital, the site and remains of which he has been able to point out.

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* In those turbulent times children were not brought up at home, but were sent to be trained up in the families of trusty friends. This was done to preserve the family line. Often, in some bloody feud, a whole household would be destroyed; yet the children, being out at foster, would be preserved, and in due time come to represent the family.

† Han war ikke ret ved sin samling.

‡ Han dreieda ainene til forskellige sides og vraengede munden.

‖ Norrænu, *i. e.*, the northern tongue (Donsk tunga), being the language then common to Denmark, Norway, Sweden, Iceland, Greenland, and part of Britain. *Antiq. Amer.* p. 35.

§ It will be noticed that they were close upon the Greenland coast.

VOYAGE OF THORWALD ERIKSON TO NEW ENGLAND, 1002.

Leif's "Vinland Voyage" became, among the colonies of Greenland, a subject of as much conversation and excitement, as in later times the discovery of Columbus at the courts of Spain and England. Leif's brother, Thorwald, was of the opinion, that the new country had not been explored sufficiently, he therefore, borrowed Leif's ship, and aided by his brothers advice and direction, and by thirty of his men, commenced another voyage to this country in 1402. He probably sailed on the track of Bjarne and Lief, along Newfoundland and Nova Scotia, and arrived in Vinland at "Leifsbudir" (in Narraganset Bay), where he and his men spent the winter, employing themselves in fishing and cutting wood. In the spring of 1003, Thorwald sent a party in the ships long boat, on a voyage of discovery. "To them appeared the land fair and woody, and but a short distance between the wood and the sea, and white sands, there were many islands, and much shallow water. They found neither dwellings of men or beasts, except on an island, to the westward, where they found a corn shed of wood, but many works of man they found not; and they then went back and came to Lief's booths in the autumn."* Thorwald in the following year, 1004, sailed from Leifsbudir (in Narraganset Bay), in his large ship, at first eastward, and then to the north, around the country. In doing this the keel of his ship was damaged in a storm, and he landed on a promontory, where he remained some time in repairing his vessel. After this, "he sailed round this spot of land, from the east to the west, into the nearest frith of the coast." The description of this sail agrees very well with the configuration of Cape Cod and vicinity, which had been seen, but not named, on the former voyages of Bjarne and Leif. Thorvald, this time, noticed the headland more minutely, and gave it the name "Kjalarnes" (Ship-nose). The outlines of Cape Cod make a figure which is much like the prow of a vessel, particularly of a Northman vessel. They had ships with a very high and pointed nose, like the head and neck of a dragon, and were, therefore, called "dragons." This circumstance may have influenced Thorvald to give this name to the cape, though it is said that the first occasion for the name was derived from his repairing his vessel there. At all events, the name "Kjalarnes," so often mentioned in the Scandinavian reports, kept its ground, because it was found so appropriate. The Scandinavian reports sometimes mention this cape under the simple name "Naeset," the *nose*, probably because it was the principal and most projecting headland of their "Vinland." This remarkable headland, on account of the snowy whiteness of its sands, always attracts the attention of the passer-by.† As a prominent and important landmark it shows to the navigator his way on the dark ocean; and so, in our researches through the dark ways of history, it will serve us as a guide when we find its unique figure put down on a chart by some explorer. Cape Cod may be called the very handle by which to grasp the hydrographical features of New England.‡ Thorwald sailed from his "Ship-nose" toward the main land, where he came to anchor not far from a hilly promontory overgrown with wood, and was so much pleased with the place that he exclaimed: "Here it is beautiful, and here I would like to fix my abode." He met there nine men of the aborigines; "eight of them they killed, but the ninth escaped in his canoe." Some time after, there arrived a countless number of "Skrellings,—as the Scandinavians called the abor-

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* They were evidently Norwegian traders who were shipwrecked while approaching the coast and sailing for the Greenland ports.

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*From the *Codex Flatoiensis*, as given in *Antiquitates Americanæ*.

†See upon this, Rafn *Antiquitates Americanae*, pp. 426, 427.

‡Collections of Maine Hist. Soc., Vol. I., p. 68.

igines, as well of Greenland as of Vinland,—and a battle ensued.* It was the first battle and bloodshed between Europeans and indigenous Americans of which we have any account. The "Skrellings" continued shooting at Thorwald and his men some time, and then quickly retired. After the victory, Thorwald asked his men whether one of them had been wounded. Upon their denying this, he said: "I am! I have an arrow under my arm, and this will be my death-blow. I now advise you to prepare for your departure as soon as possible. But me you must take to that promontory where I thought to have made my abode. I was a prophet. For I now shall dwell there forever. There you shall bury me, and plant these two crosses, one at my head and one at my feet, and call the place Krossanæs† (the promontory of the crosses), for all time to come. Thorwald, upon this, died, and his men did as he had ordered them.‡ It is supposed that it was near the harbor of Boston, and that this first battle between European and American aborigines was fought on the same ground where, in modern time, were fought the first battles of the American colonists with the British troops. The cape "Krossanæs," having a somewhat hidden position, is not often mentioned in the Scandinavian reports. Thorwald's men returned to their companions at the settlement of Leifsbudir (Narraganset Bay), and spent with them the following winter. But in the spring of 1005, having selected a cargo of wood, furs, and grapes (probably in a dried state), they sailed again to Greenland, having important and sad intelligence to communicate to Leif, Erik's son. The results of Thorwald's expedition may be summed up in a few words. Thorwald and his men remained on the coasts of New England nearly two entire years, principally occupied with explorations. They sailed along the south coast of New England toward, and perhaps beyond, New York. They recognized and described more minutely the important headland of Cape Cod, and gave to it the appropriate and often-mentioned name of "Kjalarnes" (Ship-nose). They intended to make an expedition along the coast of New England toward the north, visiting the shores of Maine, but did not come in this direction much further than the harbor of Boston, where their commander, Thorwald, was killed.

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* These people are sometimes called *Smaellingars*, or small men. Others deduce this name from *Skraela*, to dry, alluding to their shriveled aspect; and others from *Skraekia*, to shout. It is evident from the accounts of Egede and Crantz, that they formerly inhabited this part of the country, but were gradually obliged to go northward. It is well known that in other parts of America, these migrations were common. And these people were more likely to take refuge in Greenland than the Northmen themselves.

† This appears to have been Cape or Point Alderton.

‡ In 1831 there was found in the vicinity of Fall River, in Massachusetts, a *skeleton* in *armor*, and many of the circumstances connected with it are so wonderful that it might, indeed, seem almost as though it were the skeleton of this very Thorwald Erikson! This skeleton in armor attracted much attention at the time, was the subject of much learned discussion, and Longfellow wrote in the year 1841 a poem about it, beginning:

"Speak! speak! thou fearful guest!"

After which he makes the skeleton tell about his adventures as a viking, about the pine forests of Norway, about his voyage across the stormy deep, and about the discovery of America, concerning which, he says:

"Three weeks we westward bore,
And when the storm was o'er,
Cloudlike we saw the shore
  Stretching to leeward;
There, for my lady's bower
Built I the lofty tower,
Which to this very hour
  Stands looking seaward."

The tower referred to being the famous Newport tower in Rhode Island. The Swedish chemist, Berzelius, analyzed a part of the breastplate on the skeleton, and found that in composition it corresponded with metals used in the north during the tenth century; and comparing the Fall River breastplate with old Northern armors, it was also found to correspond with these in style. *America not Discovered by Columbus*, by R. B. Anderson: p. 53: Chicago, 1874.

EXPEDITION OF THORSTEIN ERIKSON, 1005.

An account of this expedition is given in the *Codex Flatoiensis*, and is copied in the *Antiquitates Americanæ*, pp. 47-55. Thorstein, the third and youngest son of Erik the Red, resolved to proceed to Vinland to obtain his brother's body. He was married to Gudrid, the daughter of Thorbjorn, and the widow of Thores, and was a woman remarkable for her beauty, her dignity, her prudence and her good discourse. Thorstein fitted out a vessel, manned it with twenty-five men selected for their strength and stature, besides himself and Gudrid. When they were ready they put out to sea, and were soon out of sight of land. But they encountered contrary winds, and were tossed about on the ocean during the whole summer, and knew not whither they were driven. At the close of the first week in winter, they landed at Lysefjord on the western coast of Greenland, where a sickness broke out among them, of which Thorstein and many others died. In the following spring, his widow, Gudrid, returned to Eriksfjord, on the southern coast of Greenland.

EXPEDITION OF THORFINN KARLSEFNE, 1007.

Next in importance and interest to the Saga of Erik the Red, is that of Thorfinn, with the significant surname of Karlsefne, *i. e.*, destined to become a great man. This distinguished individual was a wealthy and powerful Icelandic merchant, descended from an illustrious line of Danish, Swedish, Norwegian Irish and Scottish ancestors, some of whom were kings, or of royal blood. The expedition of Thorfinn was, in many respects, the most important one to New England, both as regards the numbers engaged, and the information and experience derived. We have three different accounts of this expedition. The first is from the somewhat lengthy Saga of Thorfinn Karlsefne, from the *Arnæ-Magnæan Collection.* The second is from the Saga of Erik the Red, being called the "The Account of Thorfinn," while the third is a briefer relation from the Codex Flatoiensis. The two first may be found in Rafn's *Antiquitates Americanæ*, pp. 75-200; while the last is also given in the same work, on pp. 55-64.*

In the fall of 1006, Thorfinn Karlsefne came from Norway to Eriksfjord with two ships. Karlsefne made rich presents to Leif Erikson, and Leif offered the Norse navigator the hospitalities of Brattahlid during the winter. After the Yule festival† Thorfinn began to treat with Leif as to the marriage of Gudrid,‡ Leif being the person to whom the right of betrothment belonged. Leif gave a favorable ear to his advances, and in the course of the winter their nuptials were celebrated with due ceremony.||

On this, as on former occasions, Vinland formed a favorite theme of conversation. Gudrid probably spoke to her new husband about the project of her former husband, Thorstein, of a voyage to the north. Thorfinn, urged by his wife and by others, resolved to undertake such a voyage. In the summer of 1007, Thorfinn prepared three ships,—one commanded by himself, another by Bjorne,* Grimolf's son, and Thorhall; and the third by Thorwald, who had married Freydisa, a natural daughter of Erik the Red. They had in all one hundred and sixty men,† and it being their intention to establish a colony there, took with them all kinds of live stock. The next spring they sailed to Greenland, and thence to Bjarney,‡ and thence in a northerly course to Helluland,|| and from thence two days further in a southerly direction to Markland. From Markland (Nova Scotia) they did not go out to the open sea through the broad part of the Gulf of Maine, as had been done on the former expeditions; but they coasted along a great way "to the northwest, having the land always on their starboard." They came to land, and found in the cape the keel of a ship, from which they called the place Kialarnes (Cape Cod.)§ Thorfinn and Gudrid, in following this track, probably wished to find the place where Thorwald had been buried, and his crosses erected, which they, of course, knew were to be found on the coast toward the north of Cape Cod. They, no doubt, had some of Thorwald's former companions on board. It appears from this, that we have here the first coasting voyage of European navigators along the shores of Maine. Unhappily, their reports contain no further details of the coast. As they passed along they were struck by the "long, sandy beaches and downs," and named the strand

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*Owing to the length of the narrative of Thornfin, we have taken the account as given by J. G. Kohl in the Documentary History of the State of Maine, vol 1, with occasional extracts from Beamish, DeCosta, Rafn and Anderson.

† *Yule* was a pagan festival, originally in honor of Thor, the God of War, at the beginning of February, which was the opening of the Northman's year. But as Christianity had been established in Greenland for five years, the festival was now probably changed to December, and held in honor of Christ.

‡ Widow of Thorstein Erikson. Rafn thinks, as she is mentioned in the Saga by two names, Gudrid and Thorid, that one was her name in childhood, the other in her maturer years, when Christianity came to have a practical bearing. Her father's name was Thorbjorn, derived from Thor. It was supposed that those who bore the names of gods would find in these names a charm or special protection from danger. Rafn's *Antiq. Amer.*, p. 136, note A.

Anderson's Hist. Sketch of Discov. of Amer., p. 57.

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* Literally, Bjorn, *Butter-tub,* from which we may, perhaps, infer his personal peculiarity.

† Literally, "forty men and a hundred," [forty manna oh hundrad.] The Northmen had two ways of reckoning a hundred, the short and the long. The long hundred was a hundred and twenty. Thus Tegner, describing the drinking hall of Frithiof:

> "Ei femhundrade man [til *tio tolfter* pa hundrat]
> Fyllde den rymliga sal, nar de samlats att dricka om Jelen."
> —Frithiof's Saga III. p. 18

> "Not five hundred, though told ten dozen to every hundred,
> Filled that chamber so vast, when they gathered for Yule-tide carousing."
> —American ed. ch. III., p. 13.

Professor Rafn infers that the long hundred is here meant, because he thinks that the inscription on Dighton Rock indicates CLI., the number of men Karlsefne had with him after losing nine.

‡ The present island of Disco, which was called by the Northmen, Bjarney, or Bear Island.

|| The northern coast of America was called Helluland the Great, and Newfoundland, Helluland, or Little Helluland. *Antiq. Amer.* p. 414.

§ Leif had left the keel of his vessel here on the point of this cape. In calling it by this name, they simply followed his example.

Furdustrandr,* which may be translated "beaches of wonderful length,"—the present Nauset and Chatham Beach.

In rounding the beaches towards the west, they saw several inlets, islands, and tongues of land, and met at several places strong currents. On one of the inlands an immense number of eider-ducks was found, so that it was scarcely possible to walk there without treading on their eggs.† They called this island "Straumey,"‡ (the island of currents), and to a frith they gave the name of "Straumfiordr," (the frith of the currents.) It is well known that the Gulf Stream in this region comes very near to the Nantucket Shoals, and causes amongst them and the neighboring islands very irregular currents. They landed in the "frith of the current," supposed to be what is now known as Buzzard's Bay, and made prepartions for a winter residence. But Thorhall the Hunter, a man whom Thorfinn had carried out with him, left there for the north on this discovery, and then Thorfinn himself, with the great body of his men, sailed westward, and entered the same large and beautiful bay, on the border of which Leif had built his "Leifsbudir." Not far from this spot, on the other side of the water, at a place which pleased him better, Thorfinn now erected his own larger establishment, named "Thorfinn's Budir." It stood near a small recess or bay, by the Scandinavians called "Hop," and near the mouth of a river.|| On the low grounds around this "Hop," they found fields of wheat growing wild, and on the rising grounds plenty of vines. There in a beautiful country they spent the following winter. No snow fell, and the cattle found their food in the open fields, as it may be today, in the exceptionally mild climate of Rhode Island. Sometimes the aborigines (Skrellings), would assemble around them in

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* *Furdustrandr*, from *furda*, gen. *furdu*, wonderful, and *strond*, pl. *strandir*, beach. This name seems to have been given to the eastern shores of the peninsula of Barnstable, or Cape Cod, including Nauset, Chatham, and Monemey beach, and to have had its origin either in the remarkably white sands mentioned by Hitchcock, or in a natural phenomenon, thus described by the same author: "In crossing the sands of the cape, I noticed a singular *mirage* or deception. In Orleans, for instance, we seemed to be ascending at an angle of three or four degrees; nor was I convinced that such was not the case, until turning about, I perceived that a similar ascent appeared in the road just passed over.")

† The gull, or some similar bird, is here referred to.

‡ Straum Isle, or Stream Isle, which, perhaps, indicates their knowledge of the Gulf stream.

|| This corresponds precisely with Mount Hope Bay. The Taunton river runs through it, and then flows to the sea by Pocasset river, and Seaconnet passage. Hop is from the Icelandic *I Hopi*, to recede, hence to form a bay.

great number. Thorfinn and his men bartered with them for their squirrel skins and their furs. The Skrellings liked very much the red cloth offered by the foreigners, and gave valuable furs for a small piece of red cloth not broader than a finger breadth, binding it around their heads like a crown. Thorfinn also, caused his woman to bring out milk soup, the taste of which the Skrellings greatly relished. They greedily purchased, ate it, and in this manner "carried away their bargains in their bellies," says the old Icelandic chronicler. In fact, this whole traffic of the Northmen with these "Skrellings" was carried on in much the same manner in which the later Europeans used to barter with the poor Indians; with this difference only, that in modern times they gave them rum instead of milk. Thorfinn prohibited his men from selling their swords and spears to the Skrellings, a prohibition which was afterwards often repeated by European commanders. One day, while traffic was going on in the like manner, a bull, which Thorfinn had brought with him, rushed out from the woods and bellowed loudly. At this the Skrellings were extremely terrified, and quickly disappeared in the same manner in which, at a later date, the Peruvian, at the court of Atabalipa, were frightened by the neighing of Spanish horses.

We take the opportunity of mentioning here the interesting fact that a son was born to Thorfinn and Gudrid the year after they had established themselves in their quarters at Straumfiord (Buzzard's Bay). His name was Snorre Thorfinnson. He was born in the year 1008, and he was the first man of European blood of whose birth in America we have any record. From him the famous sculptor, Albert Thorwalsden, is lineally descended, besides a long train of learned and distinguished men, who have flourished during the last eight centuries in Iceland and Denmark. We will now turn our attention again to the north, and see what was done by Thorfinn for the exploration of the northern parts of Vinland. Thorfinn had sent to the north from Straumfiord (Buzzard's Bay), his man, Thorhall the Hunter. "This Thorhall was a strong and stout person, black, very taciturn, and was familiar with the desert places of Greenland and the whole north." Being fond of exploring unknown parts, he, with eight men, had left Thorfinn's party soon after their arrival at the south coast of New England because he wished to explore the northern parts of Vinland. He sailed along "Furdustrandr" (Nauset), and "Kialarnes" (Cape Cod), and turned to the west into the interior parts of the Gulf of Maine. But there he was caught by a strong west wind, probably one of the wild northwest storms, which, coming down from the mountains of New Hampshire and Maine, sometimes happens in this bay, and still are much dreaded by the coasters. By this storm Thorhall was driven out into the broad ocean, and by other westerly gales was carried so far away, that at last he knew no better refuge than Iceland,* where he landed, and where, according to the account of some merchants, he and his men were made slaves. Thus Thorhall's attempt to explore the northern parts of Vinland (coast of Maine), in 1008, was as perfect a failure as the voyage of Thorwald to the same region some years before. Meanwhile Thorfinn's circumstances had changed. His establishment at "Hop" (Narraganset Bay) had been attacked by numberless hostile Skrellings, and after a brief fight two of Karlsefne's men were killed and a number of the Skrellings. One of the Northmen who was killed was named Thorbrand Snorreson. Thorfinn thought that, though the country offered many advantages, still the life they would have to lead here might be one of constant alarm. He made preparations, therefore to return to Greenland. But before doing this, he wanted to see his man, Thorhall the Hunter, who had not returned from his excursion to the northern parts of Vinland. Thorfinn coasted for awhile northward along the shore,† and found five Skrellings clad in skins, sleeping near the sea. They had with them vessels containing animal marrow, mixed with blood.‡ Thorfiinn's people thought that these men had been banished from the land, and so they killed them. They soon came back to Straumfiord, and leaving the greater body of his companions at his station on the coast of Straumfiord (Buzzard's Bay), Thorfinn made a searching expedition to the north on the track and in quest of Thorhall. "And they sailed northward past Kialarnes, and thence westward, and the land was upon their larboard hand. There were wild woods over all, as far as they could see, and scarcely any open places. And when they had sailed long, a river ran out of the land from east to west. They sailed into the mouth of the river, and lay by its banks."* Here, at this anchor-

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*I may add the remark, that, in a similar manner, at the end of the sixteenth century, the well-known French discoverer, La Roche, was caught by a western gale on the shores of Nova Scotia, which drove him off the coast, and chased him back towards France. J. G. Kohl, *History of the Discovery of Maine*, p. 74.

† This, likely, was a short expedition up the Narraganset Bay.

‡ The ancient Mexicans mixed human blood with bread offered on the altar of their deities.

* They appear to have sailed around Cape Cod, then steered across to Plymouth, coasted up the shore towards Point Alderton, and entered Scituate harbor, or some other river mouth on that coast.

ing place, it happened that they one day saw a "Onefoot,"* who hurried down to the bank of the river, where they lay. Thorwald Erikson stood at the helm, and the Onefoot shot an arrow into his bowels. Thorwald drew out the arrow and said: "It has killed me! To a rich land we have come, but hardly shall we enjoy any benefit from it." Thorwald soon after died of his wound. Upon this the Onefoot ran away to the northward; Karlsefne and his people went after him, and saw him now and then, and the last time they saw him he ran out into a bay. Then they turned back, and a man sang these verses:

The people chased
A uniped
Down to the beach.
Behold he ran
Straight over the sea—
Hear thou, Thorfinn!

Finding no trace of his friend Thorhall, and not wishing to expose his men to further dangers, he returned to the south. "He and his men, however, agreed on this point, that all these tracts to the north were continuous with those of the south of the Hop, and that it was all one and the same country." The "endless forests" which Thorfinn saw in the north, the river mouth where he anchored, and where he saw the Onefoot, might have been somewhere in the inner parts of the Gulf of Maine, on the coasts of the present States of Massachusetts, New Hampshire, or Maine. How far, on this excursion, he went to the north, we cannot say. But, as he believed he had now come to the dangerous "country of the Onefoots," we may put down this as one of the names under which the coasts of New Hampshire and Maine may have been designated by the Northmen. Thorfinn, not having found his man Thorhall, returned to his companions whom he had left on the coast of Straumfiord (Buzzard's Bay). He there staid with them till the next winter. It was his third winter in Vinland, but not a favorable one to the continuation of the enterprise. Discontent and dissension broke out among the settlers. As the Saga says: "The women were the cause of it, for those who were unmarried would injure those who were married, and hence arouse great disturbance." Thorfinn, therefore, in the following spring, 1011, with his wife, Gudrid, and his American son, Snorre, then three years of age, left the country together, and with a good southerly wind, returned to Greenland. It appears probable that a party of his men remained behind and continued the settlement in Vinland. Thorfinn, also carried with him two boys, aborigines of Markland, who were baptized, and to whom the Northmen afterward taught the Norse language. "They called their mother Vathelldi, and their father Uvæge. They said that two kings ruled over the Skrellings, and that one was named Avalldania, but the other Valldidia. They said that no houses were there; people lay in caves or in holes. They said there was a land on the other side, just opposite their country, where people lived who wore white clothes, and carried poles before them, and to these were fastened flags, and they shouted loud." Thorfinn never returned again to Vinland. He had brought from thence many valuable things collected in the country, and during his traffic with the aborigines, furs and skins of different animals, specimens of rare wood of several sorts, and probably other products not specified in the reports. When he arrived with this cargo in Greenland (at the end of the year 1011), two brothers of the name of Helge and Finnboge had come out from Norway. They were probably attracted by the rich plunder of Thorfinn, and persuaded by some of his companions, resolved to make a voyage to Vinland, which now began to be named "Vinland the good (Vinland det goda). They associated for this purpose with that enterprising woman, Freydisa, who had been out with Thorfinn, and who knew and liked "the good Vinland." They made with her a bargain, that they would share with her equally in all the profits, this voyage might yield. They sailed in the year 1012 to Vinland. The particulars of the voyage have no great interest for us.

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* *En Eenfoding*, from *ein*, one, and *fotr*, foot. This term appears to have been given by some old writers, to one of the African tribes, on account of a peculiarity of dress, which Wormskiold describes as a triangular cloth, hanging down so low, both before and behind, that the feet were concealed. In an old work called *Rimbigla*, a tribe of this class, dwelling in Blaland, Ethiopia, are thus described. *Beamish's Northmen*, p. 101.

Freydisa and her companions got into trouble and disagreement, probably about the "profits of the undertaking." They came to arms, and the two brothers, Helge and Finnboge, with others were slain in the fight. "Now all the men were killed; but the women were left, and nobody would kill them. Then said Freydisa, 'Give me an ax in my hand.' This was done, and she turned on those five women, and did not give over until they were all dead.'" Freydisa and her companions soon after returned to Greenland, very probably with a good booty of furs, etc. They arrived in Greenland in the spring of 1013, where Thorfinn then lay, ready to sail with his cargo for Norway. It is very probable, though it is not exactly stated, that Freydisa sold a part of her stock to Thorfinn, to take to the European market. At all events, "Thorfinn's ship was so richly laden, that it was generally admitted a more valuable cargo never before left Greenland." Thorfinn sailed to Norway, staid there the next winter, and sold his American products. He appears to have made by them a good profit. Amongst others, a "Southern man," a German merchant of the city of Bremen, in Saxonia, who happened to be present in Norway, offered to Thorfinn, for a piece of American wood, half a mark of gold. Thorfinn was astonished at this high price being offered to him by that "Southerner," but gave his wood for it. "He did not know that it was 'Mosur' he had brought out from Vinland." This "Mosur," or "Mausur," was a kind of wood then considered to be so precious, that kings sometimes had goblets of it, trimmed with silver and gold.* Thorfinn, probably with a full purse, sailed as before, accompanied by his wife Gudrid and his son Snorre, in the spring of 1014, from Norway to Iceland, where he bought an estate, and where he now settled and resided for the remainder of his life, with Snorre, his son. After the death of Thorfinn, and after Snorre had been married, Gudrid, the widow mother, made a pious pilgrimage to Rome, where, probably, as an extraordinary person, she was received with distinction, and where, of course, she spoke to the pope or his bishops about the beautiful new country in the far west, "Vinland the good," and about the Christian settlements made there by the Scandinavians. She afterwards returned to her son's estate in Iceland, where Snorre had built a church, and where, after all her adventures, she lived long as a religious recluse. From Thorfinn and his son, .Snorre, a numerous and illustrious race descended, among whom may be mentioned the learned bishop Thorlak Runolfson, born in the year 1085.†

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* This is supposed to be one of those beautiful varieties of the red maple, (acer rubrum) or sugar maple (acer saccharinum) called "bird's eye," or "curled maple," which is to be found in Massachusetts, and thought by many to equal mahogany. The old German name for maple of *Massholderbaum*, as well as the Swedish *masur* speckled wood, and *masurerad*, applied to old and knotty or marble-like wood, tends also to confirm this supposition.

† "To the learned Bishop Rnnolfson," says Professor Rafn, "we are principally indebted for the oldest ecclesiastical code of Iceland, published in the year 1123; and it is also probable that the accounts of these voyages were originally compiled by him."—*Antiq. Amer.*, Abstract of Hist. Evid., p. 34.

The Sagas give accounts of several other expeditions by the Norsemen to Vinland. In the year 1121, the voyage to Vinland of a bishop of Greenland, by the name of Erik Upsi, is mentioned in the Icelandic annals. This priest is said to have sailed to Vinland for missionary purposes. The fact that such a high ecclesiastical functionary as a bishop should go to Vinland, appears to be good proof, that, since Thorfinn's time, Northman traders, engaged in trafficking, fishing, and wood cutting, had tarried there, and that a constant intercourse with the colony had been maintained. The beauty of the country, so often praised by the Icelanders, and the profits which they had derived from some of their Vinland expeditions, must have been a great inducement to the colonists and traders to retain possession of the country, and not readily abandon it. Of the results of Bishop Erik Upsi's expedition we, unhappily, have no particular information. The last expedition mentioned was in the year 1347, but this was in the time of the Black Plague, which raged throughout Europe with unrelenting fury from 1347 to 1351, and also reached Iceland, Greenland and Vinland, and cut off communication between these countries. The Black Plague reduced the population of Norway alone from two millions to three hundred thousand, and this fact gives us some idea of the terrible ravages of this fearful epidemic. From the middle of the fourteenth century down to the modern discovery of America, beginning with Columbus and Cabot, we hear no more of Scandinavian undertakings in this direction. The heroic age of the Northmen and their power and spirit of enterprise, had long ago passed by. Iceland, the starting point and mother republic of the western colonies, had become a subordinate and neglected dependency of the kings of Norway and Denmark. The Greenland settlements and bishopric degrees had been weakened, and at last had completely disappeared, in consequence, as is believed, of epidemic, and of attacks from the Esquimaux, who came over in great numbers from Labrador; so that even their neighbors of Iceland lost sight of this country. In this manner the entire connecting chain between Scandinavia, Iceland, Greenland, and Vinland was broken, and the American portion remained to be discovered anew.* The final fate of the Greenland colony is involved in mystery. After having existed a flourishing settlement for more than four hundred years, during the whole of which period a communication appears to have been kept up with the several branches in the western hemisphere,—it vanishes altogether from the page of history; nor was it until the pious, ardent, and indefatigable Hans Egede, in 1721, after years of patient and ineffectual endeavor, at length succeeded in obtaining permission from the Danish government to form a settlement on the coast, that Greenland, in the beginning of the eighteenth century again became known to Europe.

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* Doc. Hist. of the State of Maine, Vol. I., p. 83.

RANSACTIONS . . . .

OF THE

MERIDEN SCIENTIFIC ASSOCIATION

MERIDEN, CONN.

⁂

A Review of the Year,

1893

By the President, Rev. J. T. Pettee, A. M.

PL. VI

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THE SCIENTIFIC ASSOCIATIO

OF MERIDEN, CONN., U.S.A

* * *

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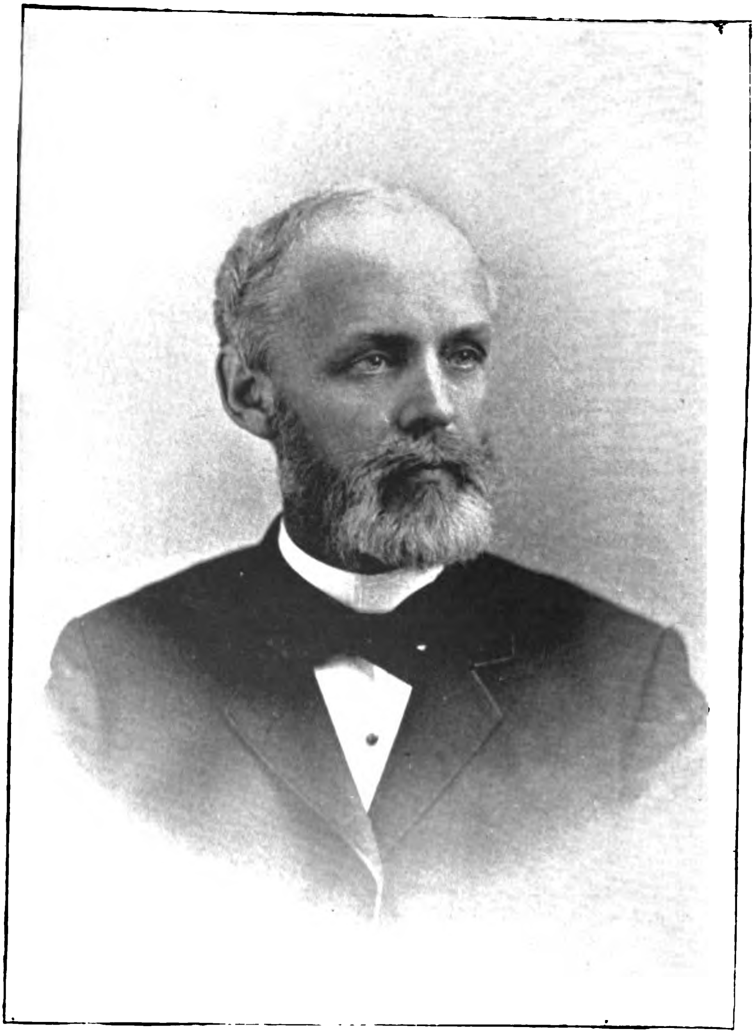

REV. J. H. CHAPIN, PH. D.

President of the Meriden Scientific Association from its organization to 1892.

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Meriden Scientific Association

ANNUAL ADDRESS

A REVIEW OF THE YEAR 1892

BY THE PRESIDENT

REV. J. T. PETTEE, A. M.

MERIDEN, CONN.
PRESS OF E. A. HORTON & CO.
1893.

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1893.

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ADDRESS.

We meet to-night to review the year; to survey the scientific field, and see what has been done by this, and other scientific associations. In our own the work has been assigned to some twenty different sections. Of these about half have been filled the last year, which we now review in alphabetic order.

ANTHROPOLOGY,

With especial reference to prehistoric man. In this we have an ancient human skull from Yucatan, reported by Prof. Putnam, at the last meeting of the American Association or the Advancement of Science, held at Washington. I wonder if this skull will excite as much interest as did the Engis and Calaveras skulls some fifty years ago. Probably not, as the world has moved the last fifty years, especially along the lines of prehistoric inquiry.

At the same meeting were presented prehistoric bows and arrows, and many other evidences of the antiquity of man.

And, in *weighing* these evidences we should remember that they are just as conclusive of man's antiquity as a prehistoric man himself. It matters not whether we find a man, or something that only man could make. The only question that can be raised in either case is as to the antiquity of the relic; and this can be determined only by the geological deposit in which it is found.

When, on the 26th of March, 1872, the skeleton of a well-formed man was found in a cave in Mentone, in the south-eastern part of France, 21½ feet below the surface, with the bones of the cave-lion, cave-bear, rhinoceros, and reindeer, no one could doubt it belonged to a prehistoric man. I refer to it now only to say that three more skeletons have recently been discovered in the same cave, and relics enough with them to throw considerable light upon the sepulchral rites of these prehistoric men.

ARCHÆOLOGY AND ETHNOLOGY.

About forty years ago the world was startled by the discovery of the Lake Dwellings in Switzerland, an account of which you may find in any good encyclopædia. It was not then supposed that similar prehistoric dwellings existed in England. Such, however, have recently been discovered at Glastonbury, in Somersetshire; and the antiquities which have been brought to light are equal in number and interest to those found in the Lake Dwellings of Switzerland. Among them are brooches, buckles, finger-rings, shuttles, combs used in weaving, needles, a grist-mill, and a splendid canoe, sixteen feet long.

The exact age of these relics is not yet satisfactorily determined. They belong however to what antiquarians call the Lake Celtic period. They antedate the Roman occupation, and are probably 2000 years old.

Interesting relics of the same age have recently been found in Denmark; plates of silver, with figures of men, women, and animals; the eye-sockets of the figures empty, but originally filled with glass eye-balls. Warriors, with helmets and other ornaments. A horned god, in a sitting posture, with his legs crossed *a la Turk;* another god with a wheel at his side, evidently the sun-god of the Gallic people. I should think the diggers had unearthed an old heathen temple. The relics certainly denote an era when as yet the light of Christianity had not penetrated to Jutland.

The richest fields of archæological discovery are, without doubt, Egypt and Palestine. These countries are perfect mines of archæological treasures. There is more in them below ground than there is above ground. And both fields have been worked the last year by well organized societies—the former by the "Egypt Exploration Fund"—the latter by the "Palestine." I have not followed the latter very closely, but have learned incidentally that of 360 unidentified places mentioned in the Bible 172 have been identified by this society.

And it is pleasant to observe that the explorers find every place just where they expected to find it from their readings of the Bible. The Bible is their best, and often their *only* guide-book. They find a perfect correspondence between the Land and the Book.

This fact, taken in connection with that other fact, that this is a scientific, not a religious, exploration, made not by theologians, but by eminent civil engineers, is certainly strong confirmatory evidence of the truth of the historic Scripture.

To Major Conder and Lieut. Kitchener, both Royal Engineers the society and the world are greatly indebted, for, as a result of their united labors, we now have a map of Palestine as elegant and accurate as the ordnance map of England.

As before intimated I have not followed this society very closely in its explorations, but have observed that, under the direction of Sir Charles Warren, it has gone down to the foundations of the walls of Jerusalem, (in some places a hundred feet,) and found even the masons' marks which the builders put on its immense stones. I have been pleased to see also that Sir Charles Wilson has recovered the synagogue of Galilee, in which Christ taught the people, and to hear him say that, on the ruins unearthed, the original synagogue could be reconstructed.

I may add, as a matter of interest to any intending to visit Palestine, that, the last year, a railroad has been built from Jaffa to Jerusalem; so that on landing at the ancient Joppa, they will find cars waiting to take them to the Holy City; and if any wish Jerusalem *to come to them*, all they have to do is to attend the illustrated lecture Mrs. Mountford will give in the Opera House, the 13th, 14th and 15th of the present month. If they hear that they will not need to go to Jerusalem.

In Egypt explorers have been equally active. The Egypt Exploration Fund has pushed its work the last year with characteristic energy. Under its labors Egypt is fast giving up its historic treasures, which, some of them at least, have been buried 4000 years; and by them we are just beginning to learn something of the real life of the Egyptian people.

And here let me say that we, Meridenites, of all others, ought to be interested in these explorations, for we have published in this city two of the best periodicals devoted to them.

THE BIBLIA, AND BIBLIA ILLUSTRATED,

Both edited by our corresponding secretary, Dr. Davis. And, for one, I am proud of the fact that, by these publications, our association is so closely associated with Egyptian Exploration. The most recent explorations have been, I believe, in Lower Egypt, around the mouths of the Nile, and near the shores of the

Mediterranean. At Tanis, Naucratis, Bubastis, temples have been unburied, tombs opened, sculptures exhumed, inscriptions copied, implements and utensils unearthed, all of which throw light upon the history of Egypt, and some of them light upon the Children of Israel. Among the implements unearthed is an ancient Egyptian scythe; its blade made, not of iron, but of sharp flint-stones, set in a groove of wood, which Mr. Petrie thinks as old as Moses, or 3,400 years. I should think much older, for farmers didn't use stone scythes in the time of Moses, but iron ones. But if no older than Moses, this scythe suggests these reflections. If the mud of the Nile can preserve a stone and wooden implement 3,400 years, could not the mud of the Red Sea preserve wood and iron implements as long? And would not a few dozen of Pharaoh's chariot wheels fished up from the bottom of the Red Sea be more conclusive of the exact place of the passage of the Children of Israel than all that has been written upon the subject?

Reflections aside—The Grotto tombs of Beni Hassan, on the east bank of the Nile, 179 miles south of Cairo, have proved remarkably rich in buried treasures. The sculptures of these tombs owe their chief interest to the fact that they represent man in his home, surrounded by his family, and are entirely free from those horrid representations of Deity which disfigure the walls of the tombs and temples of the later dynasties. *These* belong to the XIIth dynasty, which Mariette places 3,000 years before Christ. But the most instructive, if not the most interesting, finds are the rolls of papyri buried with the mummies; these often contain important historical data, and in several instances have yielded literary treasures.

Mariette says—"Under the head of a mummy, excavated at Hawara, Mr. Petrie found a long roll of papyrus, which contains almost the whole of the second book of Homer's Illiad. This was not the property of some old dried-up philologist. It lay under the skull of a young lady, whose features are still attractive, intellectual, and finely chiseled. Both skull and papyrus, together with the jet-black tresses of this nameless Hypatia, are now in the Bodleian Library, at Oxford. It is one of the three oldest manuscripts of Homer's Illiad known to exist, and the two others also came from Egypt. They are all useful in correcting the received text." Another literary find of great importance is "The Gospel and Apocalypse of Peter," of which I will say only this: The early Christian Fathers quoted from such a book. But the book was nowhere to be found. Nor *was* it found till a few years ago, when it came to light in Egypt. It has been critically examined by Prof. Harnack, of the Berlin University, the successor of the great Neander, who comes to these conclusions:

1. That it was written near the commencement of the second century.

2. That it was compiled mainly from the Gospels of Mark and Matthew; unless, indeed, all three were compiled from a still earlier work:

3. That it quotes also from the Gospel of John, showing that the Fourth Gospel was extant at the time it was written; a point which has been greatly contested by Biblical critics, many of them assigning its authorship to the later half of the second century.— But *we* have nothing to do with it in its theological bearings, but simply adduce it as one of the latest literary finds from Egypt.

Although I am aware it can add nothing to the interest of this find, will say, there was discovered recently, at Tel-el-A-mana, part of an old Assyrian dictionary, such as the scribes used who conducted the correspondence between Egypt and Babylonia. It was engraved on a clay tablet, after the manner of the Babylonians, and some of its synonyms are very distinct.

Egyptian exploration the coming year will be pushed southward, and the tombs and temples of Middle Egypt will not only be explored, but photographed.

And here let me say, I never so realized the difference between a sketch and a photograph as when viewing a collection of photographs of Egyptian tombs and temples now in the possession of Dr. Davis. Every minute line in the sculptures and inscriptions stood out as clearly as though you stood before the monuments, and not ten feet from them. Explorers are now doing just what astronomers are doing, photographing the objects of their study—astronomers the heavens, explorers the monuments—and both to the same end, that others may study them at their leisure.

In our own country good work has been done in Yucatan, in the Lake States, and in Southern Utah. In this latter territory archæological remains are almost as numerous as in Palestine or Egypt. Many have been brought to light the last year, and considerable light thrown upon the strange people who inhabited this country before the American Indians.

We might present another very interesting Palæozoic find were we satisfied that it is really what its discoverer thinks it is, or rather, that the rocks in which it was found are really *azoic*. If they are they must be called by some other name, as *azoic* means destitute of organic remains. Yet Professor Borrois, one of the most distinguished French geologists, has recently, with the aid of his microscope, discovered protozoans, in well-known graphite-bearing slate and quartzite, which Professor Borrois classes among the upper rocks of the azoic period. If they really belong to this period they are certainly the oldest organic remains yet discovered, indeed the first traces of organic life upon the globe.

ASTRONOMY.

In this science two great discoveries mark the year, that of a Fifth Satelite of Jupiter, and a New Star in Auriga.

The Fifth Satelite was discovered by Professor Barnard, at the Lick Observatory, September 9, 1892. This discovery places Prof. Barnard alongside of Prof. Asaph Hall, and Professor Bond, of Cambridge, as discoverers of satelites. Prof. Hall, you will remember, discovered the two satelites of Mars, August 11, 1877, and Prof. Bond the eighth satelite of Saturn (Hyperion), September 16, 1848. Thus the last four satelites have been discovered by American astronomers.

As American citizens we are proud of this; and, as Connecticut citizens, take special pride in the discovery of Prof. Hall, for Prof. Hall was a Connecticut boy, born in the town of Goshen, Litchfield County, October 15, 1829, and took his first lessons in algebra and geometry in the old Norfolk Academy.

The Fifth Satelite of Jupiter is very small compared with his other satelites, so small as to excite a suspicion that it is not a satelite thrown off by the great primary, but one of the little asteroids which the big planet has stolen — drawn in by his immense attraction, and appropriated to his own use. It is only a hundred miles in diameter, about half as far from its primary as our moon is from us, revolves around it every twelve hours and a half, and, owing to its rapid revolution, sometimes rises in the East, and sometimes in the west.

One very naturally inquires why was not this satelite discovered before? The answer is easy:

1. It is very small — appears in the telescope only as a star of the 13th magnitude.

2. It is very near the planet — only three-fourths of its diameter from it.

3. Jupiter is very bright, and obscures the satellite by its light. The fact is that since its discovery eminent astronomers, with large telescopes, have not always been able to find it, though they knew just where to look for it. I doubt whether it could be seen by the great Lick telescope, were not that telescope mounted 4,500 feet above the level of the sea.

THE NEW STAR IN AURIGA

Was discovered by Rev. Thomas D. Anderson, D. D., of Edinburg, near the close of the year. Its genesis is not fully explained. Perhaps the theory of Mr. Huggins is as plausible as any, viz: that two suns have come together, and are revolving around their common center of gravity, performing, as many of the stars do, a stupendous celestial waltz, but at such a distance that they seem as one. It can easily be understood how two stars united could be seen, when one alone could not; hence the appearance of a new star. But what must have been the conflagration that could be seen at such a distance! We first saw it December 10, 1891. It may have happened two centuries ago. It would probably take its light 200 years to reach the earth, although light travels at the inconceivable velocity of 186,000 miles a second.

The chief employment of astronomers now all over the world is *mapping the heavens and photographing the stars*. For this purpose the celestial vault is divided among them, and the result will be a perfect and complete map of the sky. And its advantages will be that stars which cannot be seen even by the telescope will, by long exposure, be imprinted on the sensitive plate; this can be examined, with the aid of the micrometer, by the astronomer at his leisure; and any moving body, as a comet, or new planet, will be detected by the elongated image it makes on the plate. Indeed, several asteroids have recently been discovered in this manner.

Spectrum Analysis plays a most important part in modern astronomy. Almost all new discoveries the last thirty years have been made with the spectroscope. As one has justly said, "If there was ever a flank movement on nature by which she has been compelled to surrender a part of her secrets, it was the discovery of the spectroscope, which enables us to peer into the very heart of nature. It is the open sesame of physics and chemistry. If biology could lay its hands on a similar instrument to unlock the secrets of life, what fields of discovery would unfold before the explorer!"

This is the very instrument on which Astronomy *has* laid its hands, and by which it has achieved some of its most wonderful successes. By this it has penetrated the constitution of the sun and the stars—been able to tell just what gasses are burning in the sun—whether the stars are approaching, or receding, and at what rate. And never has this wonderful instrument been used more successfully than during the past year.

According to astronomers its most important discovery has been *the full spectrum of hydrogen in the sun.* Partial spectra had been obtained before, but a full spectrum not till this year. This, I see, by the astronomical papers, astronomers regard as the highest achievement of spectrum analysis; the most important discovery of spectroscopic astronomy—and it belongs to 1892.

TELESCOPES.

The great Lick thirty-six inch refractor on Mt. Hamilton, Cal., has done splendid work the past year; but, thanks to the generosity of Mr. Charles T. Yerkes, of Chicago, who has given half a million to construct it, we are soon to have a larger, *a forty inch telescope.*

The large disks of optical glass have already been made for it, and Mr. Clarke, who made the objective of the great Lick telescope, will soon commence grinding, figuring, and polishing. He contracts to complete it in eighteen months. The mounting will be done by Warner & Swazey, of Cleveland, the firm that so successfully mounted the Lick. This mammoth instrument will be mounted somewhere near Chicago. There is no mountain there that can give it the elevation of the California telescope; and though much larger, I doubt whether, in its working, it will equal that superb instrument on Mt. Hamilton. *Mountains are the places for observatories;* where the air is pure, far from the smoke and jar of cities. The French have just found this out, and have just built an observatory on Mt. Blanc. This will be higher than the Lick Observatory; but as it has to be built on the snow which is there forty feet deep, I fear the French astronomers will have difficulty in preserving that absolute level which all astronomical instruments require.

The Naval Observatory at Washington is unfortunately located, being on low ground and too near the city. The great telescope suffers in consequence. I am glad however to see that it is soon to be removed to a new observatory on Georgetown Heights. Warner & Swazey are now remounting it for its new position. It will be remembered that some two years ago Miss Bruce of New York gave $20,000 to Harvard university for the construction of a Photographic Telescope, to be the largest and best in the world. This instrument is now nearly completed, and when finished, will be sent to the Ariquipa station in Peru, where Prof. Pickering is doing splendid astronomical work.

And while speaking of telescopes it may be well to mention the ten-foot reflector which the French have projected for their exhibition of 1900. This mammoth instrument will be 140 feet long, and it is expected that, with its highest powers, it will bring the moon within fifteen miles.

Many observations made through the year have confirmed Vogel's great discovery, made some years ago, that the variation in the light of certain stars is due to dark bodies revolving around them, so I think we may consider this question, which Lockyer called "One of the most puzzling questions in the whole domain of Astronomy," as being satisfactorily settled.

Observations of the planet Mercury made during the year have shown that this planet always keeps the same side toward the sun, just as the moon always turns the same face to the earth; and observations of Venus exite the suspicion that this planet behaves in a similar manner.

THE PLANET MARS.

The great expectations which were raised in the minds of astronomers of getting better views of this planet at its late opposition, based on the improvement in telescopes since its opposition in 1877, I am sorry to say, were hardly realized. The planet was really too low in our latitude to admit of really good observations, the most powerful telescopes availing little against a low southern declination. And even at Ariquipa, in Peru, where Prof. Pickering observed with such diligence, very little was added to our previous knowledge of the planet. We hope that at its next opposition it will run higher, and that our great telescopes will be brought to bear upon it to better advantage.

And here if I might be allowed a single criticism upon the observations that have reached me, it would be this, that astronomers, in searching for markings on the surface of the planet, have not made sufficient allowance for the clouds which float in its dense atmosphere.

The November Meteors seem to be traveling on the schedule time of Biela's comet, and in the same orbit. There can be no doubt, I think, that the comet has now become entirely disintegrated,— resolved into shooting-stars which descend in November showers. The old comet, it will be remembered, burst up in '52, and ever since, when, at the predicted time of its return, we have looked for it, we have seen, not a comet, but shooting-stars.

The usual number of telescopic comets have been reported, but none have come near enough to the earth to allow astronomers to get a good shot at them, except Holmes' comet, which has behaved so badly, that Prof. Swift says, that "it will probably prove to be a body formed by the collision of two asteroids whose orbits cross in that region."

ECLIPSE OF THE SUN, OCTOBER 20, 1892.

This was a great disappointment to all who had smoked their glass to observe it, because their almanac led them to expect that nine-tenths of the disc of the sun would be covered. The almanac-makers saw from the Nautical Almanac that the greatest magnitude of the eclipse would be 0.906, the sun's diameter being 1; but they failed to observe that this was its predicted magnitude for Long. 33° 20' W., and Lat. 61° 35' N., which would be a point in the North Atlantic, about 200 miles north-east of Cape Farewell, on the southern coast of Greenland. *There* nine-tenths of the sun were obscured, but here only about six-tenths. I should recommend that almanac-makers hereafter reduce the latitude and longitude of celestial phenomena, as given in the Nautical Almanac to the latitude and longitude of the places where they expected their almanacs to be used.

METEOROLOGY.

As Meteorology is coupled with Astronomy in our arrangement of sections, I will say that, though no meteorite has fallen "as big as a barn," several have been reported worthy of notice. One which fell at Bacubirito, Mexico, weighing twenty-five tons, another in Arizona, weighing one ton, and another in New Mexico, which, though not weighing a ton, is the most interesting and important meteorite ever discovered, *for it contains black diamonds!* — the first time in the history of astronomy that diamonds have been brought to the earth from the stellar or planetary spaces.— Here is a picture of a fragment of this meteorite, the black diamonds seen distributed through it.

Its mass, like most meteorites, is meteoric iron.

I need not add that I take no stock in the Caspian Sea Meteorite, but believe the account of it received from St. Petersburgh, a shameless canard.

To our own state belongs the honor of first

PHOTOGRAPHING A METEOR.

Something which can only happen by accident, but when it *does* happen is worthy of mention. Such was the good fortune of Mr. John E. Lewis of Ansonia, the 13th of last month. He was photographing Holmes' comet, when a brilliant meteor crossed the path of his instrument, and left its trail distinct on his plate. This is the first instance of the kind recorded, and in all probability will be the last; *i. e.*, the last instance of photographing a single meteor.

THE STAR OF BETHLEHEM.

When it was known that the bright star which appeared to Tycho Brahe in 1572, was a long period variable, (its period 314 years), it was natural for astronomers to go back in their reckoning, and see where, multiplying this by four or five, would land them; and multiplying it by five, they found it carried them back to the birth of Christ; which fortuitous circumstance suggested the Star of Bethlehem; and had it appeared again in 1886, they would have had fresh confirmation of their very pretty and innocent theory. But it did not appear. Then some revived the theory of Kepler, that the star was the conjunction of the planets Saturn and Jupiter, which theory has been modified the last year by putting Venus in the place of Saturn, and making it consist of a conjunction of Venus and Jupiter. All this, in our judgment, is idle and unscientific; and we are glad to hear an astronomer as distinguished as Prof. Louis Swift, saying in "Astronomy and Astro-Physics" for February, "I feel justified in emphatically asserting that what the Wise Men saw was not a star at all, but a supernatural light which appeared quite likely in their own dwellings, or, at least, at their dwelling-places, and was not again visible till their arrival near Bethlehem, when it re-appeared, and 'went before them till it came and stood over where the young child was.'" The Professor very properly calls attention to the fact that if the planets were in conjunction when they started, they could not be in conjunction when they reached Bethlehem, but must have then been ten or twenty degrees apart; and says, what everybody ought to know without the saying, that "a star can not by any possibility go before and guide a person to any particular house."

BOTANY.

I am not much of a botanist, and fear that any survey which I may make of the botanical field will hardly be satisfactory to the botanists of the association. If I could bring them a leaf from that Egyptian herbarium which lies in the Boulak museum, every petal of which is 5000 years old; or a tuft of that wonderful lichen from Orchilla, from which is extracted a dye as bright and beautiful as the Tyrian purple; or could lead them to that fallen forest in Arizona, where every prostrate tree is a cylinder of pure chalcedony; or could present them with some of those rare plants from the East, which, in defianee of the most approved botanical fashion, persist in growing their plant-stems triangular in section, perhaps they would forgive me, but as I can not, I will pass to Biology, merely remarking in passing that all botanists now seem to be traveling the same way. This tendency was clearly indicated and strongly supported by Prof. John M. Coulter, Vice-President of the biological section of the A. A. A. S., in his very able address at the last Washington meeting, in which he said with considerable emphasis, "What I would urge is the conversion of collecting trips into biological surveys." It is also indicated in a fact which appears in the report of the late Rochester meeting; of twenty-nine papers presented in the biological section, twenty-two are purely botanical. And by the farther fact that, by an amendment of the constitution adopted at that meeting, Biology disappears from the list of sections, and they now stand, "F, Zoölogy, G, Botany," instead of "F, Biology, [G united to section F]," as heretofore. But, after all, it is merely the difference between genus and species, Biology being a broad generic term, embracing alike all animal and vegetable life.

BIOLOGY

Then, following the old sectional arrangement of the A. A. A. S. I know of no more important investigation in this section than that which has been carried on the last year by Prof. Strasburger, of the

University of Bonn, to ascertain the cause of the ascent of water in plants; and the conclusions he comes to are, first, that it is a purely physical process; and second, that the cause is utterly inexplicable. "The evidence," he says, "all appears to favor the conclusion that the ascent of water in plants is a purely physical process. That it is not a vital one is proved by the ability to cause an upward flow in plants previously killed. Atmospheric pressure simply helps to keep the water suspended, and root-pressure is not immediately concerned in the process at all. Capilarity has long been known to be insufficient to account for the phenomena, and the net result is that we are left in the position of knowing nothing whatever concerning the cause of the ascent of sap in plants, save that the process is a purely physical one." A declaration which reminds me of the confession of the great Dr. Hunter, when pressed for a definition of life — "Life is that property which we do not understand." This subject, the ascent of sap in plants, was recently by the American Association assigned for treatment to Prof. J. W. Beal, of the Agricultural College of Michigan, and the Professor read a very interesting paper upon it at its last Washington meeting, in which he said somewhat archly, "If schemes can be devised whereby water can be raised to the top of a tall tree, perhaps we can trust to gravity to bring some of it down again"— his way of saying he could not tell how it got there. But both Profs. Beal and Strasburger are agreed that the sap ascends in the *alburnum* and not in the *bark;* an agreement which may go some way to relieve our apprehensions when the bark of our trees happens to be injured.

CHEMISTRY.

While no really new discovery has been reported in this great cience, its students have been active all along the line. It is claimed that atmospheric air has been liquified, so that it can be kept in a bulb, and hung up in a heated room, without any very rapid loss of its volume, but we prefer to see the claim established, before we report it as a new discovery.

Aside from this, what foreign chemists have done, I have hardly had time to inquire in the brief period allowed me for the preparation of this paper; but the American Association for the Advancement of Science has finished a *literary* work on which its committee has been engaged for four years, and has made a report "*On the*

Spelling and Pronunciation of Chemical Terms," which must be invaluable to teachers of this science. These are its main features:

1. The pronunciation to be as much in accord with the analogy of the English language as possible.
2. Derivatives to retain as far as possible the accent and pronunciation of the root-word.
3. Distinctly chemical compound words to retain the accent and pronunciation of their component words.
4. Similarly sounding endings for *dis*similar compounds are to be avoided.

This last we regard as very important to teachers and scholars. But the highest value of this report will, I think, be found in the *long lists of catalogued words*, which teachers and scholars can consult at their leisure. At the last meeting of the American Association Dr. Leonard Kinnicut, of the Polytechnic Institute, Worcester, Mass., presented a paper upon "The Purification of Worcester Sewerage by Chemical Precipitation;" I need not quote from it, as very able papers upon this subject have been presented to this association by Miss Carolina J. Hitchcock, Mr. George L. Cooper and Dr. G. H. Wilson.

Although the public expectation of the utility of the new metal Aluminum has been disappointed, as was shown in the very able paper read by Mr. Cooper, September 12, yet Dr. Alfred Springer, of Cincinnati, claims to have made a discovery which may be of some value to the makers of stringed musical instruments. It is this, that Aluminum makes the best sounding-boards, giving a quality of tone far superior to wood.

And in Russia, I see, Aluminum has been tried for horse-shoes. It has been found to be as durable as iron, and, of course, a great deal lighter. This is the only advantage claimed for it, which, I should think, would be more than counterbalanced by its cost. But why not try it for *wheel-tires?*

PHOTOGRAPHING IN COLORS.

Much attention has been paid the last year to Photographing in Colors. Ives & Kœnig at Philadelphia, Lipmann & Vidal at Paris, Vogel & Ulrich at Berlin, have all been experimenting; and though their efforts have not been crowned with complete success, they have had enough to encourage the expectation that, before the present century closes, we shall have colored photographs; shall be able to sit for a picture, and rise from a sitting, leaving not a mere shadow but a life-like portrait on the plate.

In Conchology we have done nothing the past year, and, as far as I can perceive, the scientific world has not done much more; I therefore pass to

ELECTRICAL SCIENCE.

Glancing first at the effect of electrical light on plants, which has been pretty closely observed by Prof. L. H. Bailey, Agricultural Experiment Station of Cornell University; who finds that all plants but endive and cauliflower are greatly benefitted by it, their maturity being accelerated by from five to fifteen days; but the seeds of such, if planted, do not do as well as those matured in the dark. On the whole, he concludes, "that the light can be used to advantage in the forcing of plants." The lamp used by Prof. Bailey was an arc lamp, 10 ampere, 45 volt, 2000 nominal candle power, Westinghouse alternating current, shaded by a clear glass globe, hung outside of, and in the valley between, two green-houses, about six feet above the nearest glass. It seldom burned after 11 p. m., and on moonlight nights not at all.

If one had told us ten years ago that in 1892 men in New York would converse easily with men in Chicago, we would not have believed him. But that was just what was done the 18th of October. And, as you saw by the papers, the 20th of January, this year, a concert, given in New York, was distinctly heard in Chicago, the distance being 913 miles. And later still the musical abilities of a young woman, playing in New York, were tested by Theodore Thomas, listening in Chicago.

Surely, we must include the Long-Distance Telephone among the electrical achievements of the year. And if we may add the automatic switch-board, by which the services of the "hello-girl" are to be dispensed with; and if the new company, just formed in Chicago, fulfill its promise to give us telephone service at half the present rates, it will afford us an illustration of "applied science," which I am sure we shall be quick to appreciate.

And beside the long-distance telephone we must place the transmission of electricity long distances, as at Tivoli, in Italy, where the electric current, generated by water-power, is conducted 17 miles, to light the city of Rome. This, however, is a baby-plant compared to that now building at Niagara Falls, of 250,000 horse-power, which it will be able to send 50 or 100 miles, for heating, lighting and manufacturing.

And who can estimate the energy that will be exerted, when all the waste water-power in America is thus utilized? What though the coal and gas give out, and steam-engines have to be relegated to the Past. America is safe for a thousand years. And then, when we shall have discovered the subtle connection between heat and electricity — when we shall be able to take our electricity directly from the furnace, or what is better still, directly from the sun, without the dynamo coming in as a middle-man between, then we shall have no farther use for steam-engines or water-wheels, at least till the coal is exhausted.

In passing from this section I would acknowledge the indebtedness of the association to Mr. Newell F. Wightman of Hanover, for a very interesting and instructive lecture on Dynamos and Electric Lighting; and now and always to Hon. O. H. Platt, Senior U. S. Senator from Connecticut, for Washington publications.

Entomology. As not a bug has presented himself for dissection this year, we pass to

GEOGRAPHY,

Civil and physical; in which Prof. Frost, at least, has done good work. The association acknowledges its indebtedness to him for many instructive lectures and papers. We only fear, as he reviews the work of his section, that he will be obliged to say, with the Latin poet, *et quorum pars magna fui*.

Geographical work must be pushed mainly by *explorations*. Our own country has taken the lead in those directed to the Arctic. As we have heard from Prof. Frost, Lieut. Peary, by a new route, has pushed as far north as 81° 37′, only 500 miles from the Pole. Here, on the Fourth of July, 1892, he planted the American Flag, and very properly named the waters that rolled to the North of him, Independence Bay. The brave explorer is now preparing for a second expedition. The best wishes of the nation go with him, and their prayer for his safety, as, leaving the highest station of his last expedition, he makes his dark and perilous journey across the frozen Arctic Ocean. May he plant the Flag on the Pole itself, its staff in exact alignment with the axis of the earth!

Should it be asked "What has Lieut. Peary learned from this expedition?" We answer, that Greenland is an island and not a continent; and that the only way to reach the Pole is across the frozen Arctic Ocean.

And here let me say to those who have $3.50 to spend, that a superb work has just been published, entitled "*In Arctic Seas,*" written by Drs. Keeley & Davis, who accompanied Peary's expedition. I have not seen this work, but from a notice of it in the *Arena*, for February, think it contains some things which will surprise you: as, for instance, that the party suffered greatly from mosquitoes, when less than a thousand miles from the North Pole; and that every patch of ground from which the sun had removed the snow was covered with brightest flowers.

EARTHQUAKES.

We naturally conceive of the Earth as something that is *stable.* In reality nothing is more shaky. There is not a day, nor an hour, that the seismometer does not indicate seismic disturbances in some part of the world. I am often reminded of the remark of a facetious friend, made, it is true, metaphorically, but susceptible of a literal interpretation, "This earth, after all, is a pretty unstable old peat-bog." It is indeed unstable, as shown by the earthquakes of the year. The most violent was June 7, in the Island of Sanguir, in the Malay Archipelago, when its only volcano, Gunana-Ava, burst out in eruption, and swept 8000 of its inhabitants to a fiery or watery grave.

Since writing this we have learned that two volcanoes in Mexico, Orizaba and Colima, are threatening eruptions, and that Padernal Peak, in New Mexico, after having been quiet for seventy-three years, is erupting with great violence, and threatening to bury in its lava a ruined city of the Cliff-Dwellers. If these dwellings are now to be overwhelmed, it is fortunate that American explorers explored and reported them when they did.

And as late as January 31st, and February 2nd and 7th, the island of Zante, in the Ionian Sea, was violently shaken, many of its buildings thrown down, and many of its inhabitants killed or injured. This island belongs to Greece. It is about 25 miles long, and 12 broad. It is the island our dried currants come from, (which are not currants at all, but small grapes), the crop being usually about 12,000,000 lbs. a year.

THE DARK CONTINENT.

Since Stanley returned from Africa there have been few geographical discoveries in the Dark Continent. Lake Chala on the south-east coast, has been explored by Mrs. French Sheldon, the brave and beautiful woman, who lectured in Meriden last autumn; and Mr. William A. Chanler is now conducting an exploration on the north-west coast, along the river Tana, a beautiful stream — a sort of a miniature Nile, the country through which it flows, dependent upon its inundations for its fertility, just as Egypt is dependent upon the Nile.

Mr. Chanler was at Ham-ey-e, on this river, when last heard from, the 28th of November. We shall watch his exploration with great interest.

Our attention has again been directed, by The London Saturday Review, to Lake Mœris in the North of Africa, and to the surveys of Mr. Cope Whitehouse, an English Civil Engineer, who found its ancient bed quite equal in extent to the dimensions assigned by Herodotus, 450 miles in circumference. This lake was mainly an artificial reservoir, made to hold the surplus water of the Nile, and was without doubt the largest reservoir ever constructed. It is the opinion of Mr. Whitehouse and other engineers that, with a little digging and damming, it could be restored to its original dimensions, aud the whole Delta be made as fertile as it was in the reign of the Pharaohs.

LAKE TITICACA.

In a geographical work recently published, I see Lake Titicaca referred to as a *salt* lake — "the highest salt lake in the world." As the Desaguadero, a considerable river, flows out of it, I hardly see why this should be. I know that its dimensions have greatly shrunk since the days of the Yncas, for the then great and brilliant city of Tia-Huanaco, three centuries ago stood on its shore, but is now twelve miles inland, and its depth has been diminished by a hundred and fifty feet. There are salt lakes enough below it, among them Lake Leman, of which Reclus says, "there is mire on its shores, and briny bitterness in its bosom," but Titicaca lies some hundred feet above them: why then should its waters be salt? I await an answer from the geographer of the association.

GEOLOGY AND PALÆONTOLOGY.

In this section we have done nothing since the death of our late President, Dr. James H. Chapin; which sad event occurred March 14, 1892. But there has been the usual activity in the geological fields, and I may speak of one or two geological discoveries made near home. One at the Portland quarries, where, last summer, the workmen blasted out a block of sandstone, 130 feet below the surface, containing the foot-prints of the *Anischnus Deweyanus*, a sort of Crocodile-Bird, which was very common in the Connecticut Valley, when as yet there was no Connecticut River, but an estuary of the sea extended from the Sound far up into the State of Massachusetts. Prof. Rice, of the Wesleyan University, knew the value of the fossil and immediately secured it, presumably for his College.

Another discovery of footprints of hardly less interest, has been made near Holyoke, Mass., and there the marks resemble the tracks of birds more than the tracks of reptiles. They were evidently the footprints of a *Dinosaur*, and show that the dinosaurs were "sketches of a new design, and farther away from the reptiles than from the birds." You remember that when Dr. Edward Hitchcock, the great geologist of Massachusetts, first discovered and described the footprints of the Connecticut Valley, he called them "bird tracks," and they were called bird tracks for many years, then they were regarded as the tracks of reptiles; now the geologic pendulum seems to be swinging back again to the old nomenclature. "A new horizon of fossil fishes" has been discovered by Rev. Wm. M. Blackburn, from the Ree Hills, in South Dakota, described in the American Naturalist, and reported by Prof. E. D. Cope to the American Association. His report is too scientific to be of general interest, but we can take the word of this great naturalist for it, that it *is* "a new horizon;" by which we understand that these fishes lie in a plane higher or lower than any heretofore discovered.

ICTHYOLOGY.

Of living fishes we have no report; none have swam into our association the last year, and as far as I have observed, they seem to have played shy of other associations. I did read an account of a new fish caught in New York Harbor, but saw no scientific description of it. The fact is a fish is not of much account till he becomes a fossil; just as many men are not of much account till they are dead. It is to be hoped however that in another year some live fishes will swim into our aquarium, and some one be found in our association able to describe alike their habits and their habitats.

HERPETOLOGY.

Prof. Simon H. Gage, of Ithaca, N. Y., makes a remark about the colors of the water-newt which may apply to other lizards. He says, "After becoming adult and transforming into the viridescent form, it always remains of that general coloration whether it lives in water or on land, thus showing that neither food, season nor environment gives rise to the coloration, but that it is normal for a definite phase or period of life." It occurs to me that it may be the same with the chameleon, and with *Phrynosoma Cornutum*, or "horned toad," which is not a toad at all, but a lizard. It will be remembered that we have one of these interesting creatures in our cabinet, still "in good spirits," though it has been dead for years; and when it was presented to the association considerable was said about a power it had of transcoloring itself; and a question arises, would not Prof. Gage's remark apply to this lizard as well as to the water-newt? By the way, Prof. O. P. Hay, of Indiana, deems *Phrynosyma Cornutum* of sufficient importance to make it the subject of a paper. What he remarks is that "A considerable quantity of red fluid was thrown out from the eye, and a microscopical examination proved it to be blood."—*His* specimen came from California; *ours* from Texas.

MECHANICS.

I know of no new mechanical power that has been invented the last year; nor, as for that, for several years.

Keeley's motor doesn't move: electricity does not as yet come direct from coal or from the sun; the flying machine doesn't fly, though no less an authority than Prof. Langley thinks that it may; the dirigable air-ship does not yet navigate the ærial ocean, though, *to put an end to war*, we wish that it did.

A safety parachute, however, has been invented, *which is always open;* indeed, it can not close, for it envelopes the balloon.

I know, however, of no inventions more likely to be useful than two which have emanated from members of this association. The

Safety Lamp, by F. J. Seidensticker; the *Aural Masseur*, by Dr. Wilson.

The first is an attachment to a metallic kerosene lamp, constructed on strictly scientific principles, in which, by observing the relative refractive indices of oil and glass, the inventor causes a metalic disc with the word FULL, in capital letters, to come into view as soon as the lamp is safely full—just as the flush appears on the face of the drinker when *he* is full—for which he has just received a medal from the Massachusetts Mechanics Association.

The second, by Dr. Wilson, by which, for the first time "massage" is applied to the delicate organs of the ear; by tone-touches more gentle than the touches of a lady's hand, for which we trust the Doctor will receive what is more valuable than medals of silver or gold, the consciousness of having conferred a benefit upon his fellowmen. We take a special interest in these inventions because they emenate from The Meriden Scientific Association.

I see by the papers that Mr. Andrew Carnegie has just contracted, to be used in his works at Homestead, for a circular diamond-saw, seven and one-half feet in diameter, at the trifling cost of $35,000; by use of which his workmen expect to be able to trim and square their immense armor-plates, some of them twenty inches thick, as quickly and easily as a ship-wright turns and squares his timbers. And I call attention to it to say, that diamond-saws are no new invention. They were used, together with diamond-edged chisels, diamond-pointed drills, and diamond-set lathe-tools, by the Ancient Egyptians, 6,000 years ago.

We have often wondered how the Egyptians cut their hard granite-having, as we supposed, nothing but bronze tools to work with, and to help them over the difficulty, have ascribed to them some mysterious process of hardening bronze; and I remember to have heard Wendell Phillips, in one of his most beautiful lectures, speak of this hardening process as one of the lost arts. Now this is all imagination. Bronze was no harder 6,000 years ago than it is now. The way the Egyptians hardened it was to edge it with diamonds. If the bronze was hard enough to hold the diamond that was enough. Mr. W. Flinders Petrie, in his last work on Egypt, says, that marks of diamond saws, both plain and circular, are found on their work, and cores of drillings and borings, ranging from one to eighteen inches in diameter. The royal sarcophagus in the Great Pyramid was bored out with such a drill, and afterwards trimmed down with diamond-edged chisels; the marks of the great core-drill can be clearly traced, and its diameter determined. Mr. Petrie has in his possession several cores taken out by such drills, and one he had to break off with a chisel, as it was left in an unfinished hole. A truce then to all of this talk about hardening bronze. Let us do as the Egyptians did, edge our tools with corundum or diamonds, and the softest bronze will be hard enough.

"Wire Glass," as it is called,—more properly Glazed Wire Netting—is, I think, a happy device, though not involving any new principle. By this device wire netting of any size, after being thoroughly polished, is encysted in a coat of glass, which effectually preserves the wire from oxidation, keeps it always bright, and gives its support to the glass. It must be excellent, I think, as a guard to high skylights. It would obstruct but little light, always be bright, and when placed beneath heavy plates of glass, such as form the roof of the N. Y. Central Depot, be a great protection to the cars and passengers beneath.

MECHANICS AND ENGINEERING.

The vast achievements of the present age in mechanics and engineering would challenge our credulity did we not remember one thing, viz.: that there is nothing impossible to engineering and mechanical skill *if there is money enough*. Every thing reduces to a matter of expense. Mr. Batterson was not at all extravagant when he said he would like no better job than to take down the Great Pyramid and set it up in Hartford. All we mean now, when we ask, "Can a thing be done?" is, is there money enough to have it done.

MICROSCOPY.

The microscope is now the chief working instrument in almost every branch of scientific investigation. The botanist, biologist, chemist, can do nothing without it. It reveals creation at one end, just as the telescope does at the other; and at several points the microscope and telescope touch. The telescope may sweep the skies, but when it comes to reading the minute angles of its scales, and examining its photographs of the heavens, then the big tube confesses its dependence upon the little one, and Astronomy bows in obeisance to Microscopy.

The microscope, the past year, has been largely employed on the bacillus of disease. It is now pretty generally admitted that every disease has its distinctive bacillus, and the knowledge of its bacillus is of greatest importance in diagnosing the disease. Whether it will aid essentially in its treatment remains to be seen. No physician, however, wants to work in the dark, and so long as the germ theory is accepted, the microscope must be one of the physicians most important working instruments. This section of our association is very properly under the direction of an able physician, who has the past year given us several microscopic lectures; but he has been so often detailed for other duties, been obliged to speak so often on other subjects, that he has not given us as many microscopical lectures as we should have been pleased to have heard. We hope that another year Dr. Wilson will treat us to more subjects purely microscopical.

BACTERIOLOGY.

Prof. Lachland recently read a paper before the German Botanical Society, in which he gave an account of some investigations which he had been conducting on the bacteria found in different kinds of tobacco. He had examined fermented tobacco from all parts of the world, and found large numbers of micro-organisms, though not generally more than two or three varieties in any particular brand. But what is of special interest is the discovery that pure cultures of bacteria, obtained from one kind of tobacco, and inoculated into another kind, generated in the latter a taste and aroma, recalling the taste and aroma of the tobacco from which the pure cultures were procured. Thus it may be possible to raise the quality of home-grown tobacco by inoculating it with cultures of the bacteria found in the finer flavored foreign tobacco. But why confine the inoculation to tobacco? May not the quality of any plant, whose value is in its leaf, be improved in the same manner?

I hope it will present no temptation to any member of this association if I allude to another reputed discovery, that the cholera bacilli are short-lived in fumented liquors. Recent experiments, according to the *Pharmaceutische Zeitung*, have demonstrated that the cholera bacillus does not live beyond three hours in Pilsener, Patzenhofer, or Munich beer, two hours in Berlin white beer, five minutes in white wine, fifteen minutes in red wine, and twenty minutes in cider. In boiled milk it succumbed on the tenth day.

Coffee and tea infusions proved fatal in from two to four hours. The bacillus flourished in chocolate." But there is one big bacillus that lurks in all intoxicating liquor, and "in the end it biteth like a serpent and stingeth like an adder." And I hope the lovers of butter will not be alarmed by the announcement that 2,465,555 micro-organisms are contained in every gramme of butter taken from the center of the lump; and 27,250,000 from every gramme taken from the outside, for every one is at liberty to count them.

In the province of Thessaly in Greece Bacteriology has been turned to practical use in exterminating field-mice, which are there as destructive to crops as the rabbits are in Australia. About a year ago, Prof. Loeffler, one of Prof. Koch's most prominent disciples, discovered a bacillus which produces a deadly typhus-fever in both house and field-mice. Mixed with mouse-food it developes a deadly disease in from eight to fourteen days, but is not dangerous to cats, rats, rabbits, pigs, small birds, pigeons, chickens and sheep, The mode of giving it was this: Pieces of wheat bread, about an inch in thickness, thoroughly saturated with the bacilli-fluid, was placed in each mouse-hole in the expectation that the mice would eat it. They did eat it, and were killed, and the air was soon filled with birds which fed on them. The experiment was perfectly successful, and highest honors were showered on Prof. Loeffler. Would that some one could invent a bacillus which would kill the rabbits of Australia. Such a man would not die poor; the government would reward him handsomely.

THE MICROPHONE IN MEDICINE.

The microphone of Prof. Hughes for detecting sounds too feeble for the unaided ear, has been applied to the stethoscope by more than one physician, but generally with indifferent success. Persistent efforts are nevertheless being made to turn the instrument to practical account in this direction; and lately a Russian lady was saved from premature burial by means of a microphone placed over the region of the heart, which could then be heard beating, although she had been considered quite dead.

More recently Dr. Blydell, of New York, has invented a micro-stethoscope, by which he can distinguish sounds of the heart, lungs, bloodvessels, and other organs which are wholly inaudible to the ear alone.

ORNITHOLOGY.

As no live bird has lit in our association the last year, allow me to report a fossil one, found recently in New Zealand, which must have been, according to its bones, fourteen feet high.

When the great Zoologist, Richard Owen, in 1850, reported a *Diornis Giganteus* ten feet high, the world stood aghast — now we have one fourteen feet high; about twice the height of the tallest ostrich.

TECHNOLOGY, ZOOLOGY, AND GENERAL SCIENCE.

These sections having been unrepresented through the year, I pass to one which, though not always filled, is never wanting in subjects,

NECROLOGY,

The Record of the Dead. When Daniel Webster rose in the United States Senate to pronounce a funeral eulogy upon Hon. Isaac C. Bates from Massachusetts, who had then just fallen at his post, he said substantially this: Gentlemen, the most important thought for us to consider is, that as sure as we continue here in our work *we shall die*. This is perhaps the most important thought for us, as we now make up the record of the Dead.

The year has not removed as many illustrious men as it sometimes does, but we recall the names of several: Prof. Hofmann, who filled the chair of Chemistry in the University of Bonn; Prof. Siemens, eminent as an inventor, more eminent as an electrician; Cyrus W. Field, to whom, though not a scientist, more than to any man we are indebted for the Atlantic Cable; Charles A. Seeley, Professor of Chemistry and Toxicology in the New York Medical College, and an eminent electrician; James S. Newberry, N. Y., than whom we've had no better geologist since the death of Percival, best known to the world of science as a specialist of fossil icthyology; Eben Norton Horsford, Professor of Analytical Chemistry in Harvard University, learned in Indian languages, an able and copious writer, but longest and best remembered as the man who first recommended to pour oil upon the troubled waters, and the man who, to his own satisfaction at least, located Norumbega;

Prof. W. Trowbridge, August 12; John G. Owens, a student in the graduate school of Harvard University, and holder of Hemenway Fellowship, who died in Honduras, Februaty 18, a student in Prof. Putnam's department and in charge of the Peabody Museum Honduras expedition. He left Cambridge last November and up to the time of his death his explorations had been very successful. He was regarded by Prof. Putnam as a promising student, and one who would soon take his place as one of the leading anthropologists in America. He was born in Lewisburg, Penn., in 1866, and graduated in Bucknell University in 1887. He would have receivec his doctor's degree at Harvard next June.

Sir Richard Owen, K. C. B., F. R. S., eminent as a Naturalist and Biologist during the last half of the present century, died at his home in Richmond, England, December 18, 1892, in the eighty-ninth year of his age. He was born at Lancaster, Eng., July 20, 1804; in 1856 appointed Superintendent of the Natural History Department of the British Museum, which post he held till 1883, thus retiring in his eightieth year to well-earned rest, in the little cottage in Richmond Park, which had been accorded him by the royal bounty as far back as 1851. The results of scientific work extending over half a century are scattered through numerous memoirs and minor treatises, but are specially embodied in Sir Richard's *magnum opus*, "The Comparative Anatomy and Physiology of the Vertebrate Animals," which fills three volumes. To write his biography is to write the history of biological science for the last fifty years. In his "Règne Animal," published in 1817, he shows that the agreement between the different parts of an animal is so close that the knowledge of any one part gives the clue to the whole structure, and therefore to the nature and habits of the animal. Give him a single bone and he could tell you not only the animal it came from, but the size and habits of the animal; just as Agazzis would determine the species and variety of a fish from an examination of a single scale. He did not fully agree with Mr. Darwin in his doctrine of the mutability of species, and to this extent may be said to have been behind the science of the age. "But," in the language of another, "no man has done so much as he to re-create the past, in visiting the 'valley of dry bones,' and in re-forming these relics with the strange, uncouth life that endowed them; and in restoring in vivid outline that ancient world when 'huge dragons of the prime' wallowed in the basins of the Thames and Seine, and when, later still, wild carnivora, as lions, hyenas, and their kin, contested with man the supremacy of the sites where now London and Paris stand."

Col. Thomas William Fletcher, a well-known English Antiquarian, died recently at the advanced age of eighty-five. An M. A. of Dublin and Oxford Universities; a Fellow of the Royal Geological and Antiquarian Societies, who, on account of his researches fifty years ago into the composition and fossils of the Dudey coal-field, was elected a Fellow of the Royal Society.

Mr. George M. Whipple, Superintendent of the Meteorological Observatory at Kew. He was a high authority on terrestial magnetism, and contributed valuable reports on that subject to the Royal Society.

LEWIS MORRIS RUTHERFURD, most eminent of American astronomical photographers, born at Morrisania, N. Y., November 25, 1816, and died at his country home, Tranquillity, N. J., May 30, 1892. In 1863 Mr. Rutherfurd published in the American Journal of Science, a paper dealing with the spectra of the stars, the moon and the planets, the first published work of the kind after that of Bunsen and Kirchoff, and the first attempt at classifying the stars according to their spectra. He also devised a ruling engine, capable of turning out much finer gratings than those of Nobert. He bequeathed his instruments, and 1448 plates of the sun, moon and stars to Columbia College; and speaking of these plates, Prof. Gould emphasises the fact that they were made before the discovery of the dry-plate process, by the aid of which celestial photography has made such wonderful progress in recent years; and says most justly, "we owe to him not merely the first permanent records of the relative positions, at a given moment, of all the celestial objects impressed upon the sensitive plates, but the means and the accomplishment of the actual conversion of these records into actual numerical data."

Mr. Rutherfurd was a member of many scientific societies, and was often called into conference on important scientific matters. He was a member of the International Meridian Conference that met in Washington in October, 1885, and took a prominent part in its work, framing and presenting the resolution that embodied the conclusion of the conference. He was invited by the French Academy of Sciences, in 1877, to become a member of the International Conference of Astronomical Photography, held in Paris in that year, and was given by the President of our National Academy of Sciences the appointment of its representative, but the condition of his health forbade his serving. He was an Associate of the Royal Astronomical Society. He was an original member of the National Academy of Sciences, which was incorporated by act of Congress in 1863. In 1867 he was elected President of the American Photographical Society, in the official board of which he had served many years as Vice President. For many years he was not only a Trustee of Columbia College, but one of the most active and hard-working members of that body. The college will remember him for his efficient services as trustee, no less than for the valuable instruments and photographs which he left it.

Of his *personality*, Mr. O. G. Mason says, in the Photographic Times: "No one would be long in his presence without feeling that he was a man of rare ability. His tall, erect figure, and scholarly face made him conspicuous wherever he went. His dignified, courtly bearing and genial nature made earnest friends of all his acquaintances. His dislike of ostentation and show was a conspicuous trait of his character. He was never known to wear any of the many decorations, emblems of rank, or acquirements which had been conferred upon him. His signature was his plain name, without the addition of any of the literary and scientific honors he had a right to use. His liberality in the diffusion of the knowledge which he had gained was known and appreciated by hundreds who sought his advice; and his wise counsel was sought and recognized as being of the highest value."

[From Popular Science Monthly for January, 1893.]

To these I add also another honored name, that of Rev. Alfred H. Hall. Although he died just before the opening of the year, Dec. 27, 1891, it seems eminently proper that he should be named in our record of the dead. Although he did not claim to be a scientist, yet he kept abreast of the science of the age. He always manifested a lively interest in our association, and in its early history assisted it with able papers and lectures.

And one more, who to us was more than all the rest, Dr. James H. Chapin, Ph. D., our president, till this year, from the commencement of our history; our instructor in Geology, his favorite science; always, at home and abroad, interested in the welfare of this association; jealous of its standing and reputation; endowing its cabinet with well selected specimens; favoring us with more valuable geological talks and lectures,—I mean all that I say, he was more to us than all the rest. Would that his mantle had fallen on worthier shoulders. May his zeal in the cause of Science inspire every member of this association. As a fitting tribute to Dr. Chapin I append the Memorial adapted by the Association soon after his sad and sudden death.

In Memoriam.

REV. JAMES H. CHAPIN, Ph. D.,

PROFESSOR AND LECTURER IN ST. LAWRENCE UNIVERSITY, AND FIRST PRESIDENT OF THE MERIDEN SCIENTIFIC ASSOCIATION.

◆

Few men have touched this community at so many points as Dr. James H. Chapin. Other organizations with which he was connected having already, by resolution and address, expressed their appreciation of his worth, we, members of the Meriden Scientific Association, embrace this, the earliest opportunity afforded since his death, to record our appreciation of his private and professional character, and our sense of the irreparable loss we have sustained in his death.

To our association Dr. Chapin's relations were almost vital. For ten years, whenever in the city, he presided over it with dignity and ability. For ten years he stood alone at the head of one of its most important sections, that of Geology and Paleontology, a position for which he was eminently fitted by his long continued studies and teachings. During these years of presidency and membership we have been indebted to him for many able lectures and addresses.

And now that we have heard the last from his instructive lips, we here record our high estimation of his worth, and our sense of the great loss we have sustained in his death; and order this testimonial recorded on our journal, and presented to his bereaved and stricken family.

J. T. Pettee,
Geo. L. Cooper, } Committee.
Sarah I. Shaw,

Transactions of the Meriden Scientific Association.

VOL. I.

Catalogue of the Phænogamous and Vascular Cryptogamous Plants found growing in Meriden, Conn., from 1881 to 1883. Emily J. Leonard.

VOL. II.

The Catopterus gracilis. Chas. H. S. Davis, M. D.

The Hanging Hills. J. H. Chapin, Ph. D.

An Interesting Find. J. H. Chapin, Ph. D.

A List of the Birds of Meriden. Franklin Platt.

Additional Plants found growing in Meriden. Mrs. E. B. Kendrick.

West Peak, and What It Saith. Rev. J. T. Pettee, A. M.

VOL. III.

The Ash Bed at Meriden and Its Structural Relations. Wm. Morris Davis.

The Nidus of Lunatio Heros. F. J. Seidensticker.

The Trap Ridges of Meriden Again. J. H. Chapin, Ph. D.

Some Notes of Africa. J. H. Chapin, Ph. D.

The Horizontal Moon. Rev. J. T. Pettee, A. M.

A Supplementary List of the Birds of Meriden. Franklin Platt.

A List of Butterflies of Meriden. Franklin Platt.

A List of Forest Trees and Shrubs to be found in Meriden. Chas. H. S. Davis, M. D.

VOL. IV.

James G. Percival, M. D., Portrait. Rev. J. T. Pettee, A. M.

Sewerage; Its Carriage and Disposition. Geo. L. Cooper.

The Topographical Survey of Connecticut. J. H. Chapin, Ph. D.

Some Geological Features of Meriden. J. H. Chapin, Ph. D.

Cycadinocarpus Chapinii. J. H. Chapin, Ph. D.

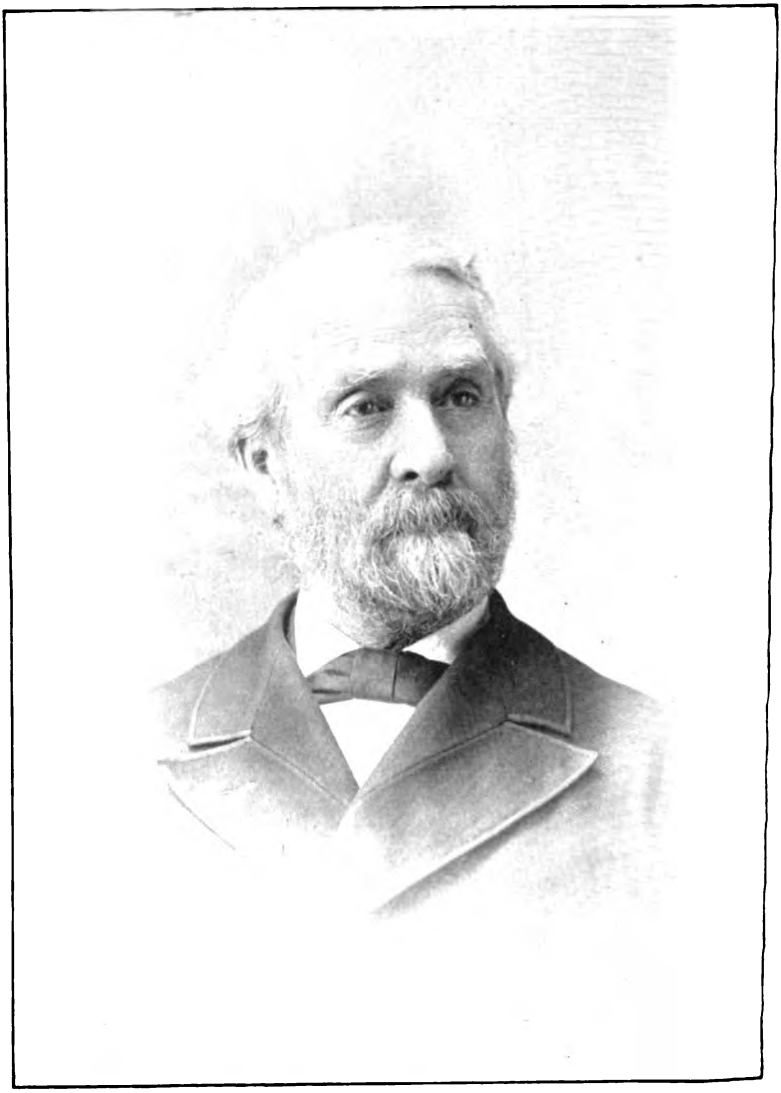
The Pre-Columbian Discovery of America by the Northmen. Chas. H. S. Davis, M. D.

RECEIVED,
FEB 19, 1894.
PEABODY MUSEUM.

Case -- Shelf
LIBRARY
OF THE
Peabody Museum of American Archæology and Ethnology
IN CONNECTION WITH HARVARD UNIVERSITY.

PRESENTED BY
the Association

Received Feb. 19, 1894



REV. J. T. PETTEE, A. M.

President of the Meriden Scientific Association.

3

RECEIVED,
FEB 19 1894

Meriden Scientific Association

ANNUAL ADDRESS

A REVIEW OF THE YEAR 1893

BY THE PRESIDENT

REV. J. T. PETTEE, A. M.

MERIDEN, CONN.
PRESS OF THE HORTON PRINTING CO.
1894.

L. Soc. 120. M.3
Gift of the Association
Rec. 2/19/94

Officers of the Meriden Scientific Association.

1894.

REV. JOHN T. PETTEE, A. M.	President
SIMEON T. FROST, A. M.	Vice President
GEORGE L. COOPER,	Recording Secretary
CHAS. H. S. DAVIS, M. D., Ph. D.	Corresponding Secretary
G. HERRICK WILSON, M. D.	Treasurer
ROBERT BOWMAN,	Curator
W. L. BABCOCK, REV. G. K. MCNAUGHT,	Auditors

Directors of Sections.

ARCHÆOLOGY AND ETHNOLOGY,	C. H. S. Davis, M.D., Ph.D.
ASTRONOMY AND METEOROLOGY,	Rev. J. T. Pettee, A. M.
BIOLOGY,	Mrs. A. A. French
BOTANY,	Mrs. T. Francis Guy
CHEMISTRY,	Miss Caroline J. Hitchcock
GEOGRAPHY AND TRAVEL.	S. T. Frost, A. M.
GEOLOGY AND PALÆONTOLOGY.	
MICROSCOPY,	G. Herrick Wilson, M. D.
PHYSICS,	George L. Cooper
TECHNOLOGY.	

Report of Secretary.

To the Meriden Scientific Association:

Your Recording Secretary has the honor to present his annual report as follows:

Number of members on the roll of the Association as per last report, . . .	82
Elected to membership during the year, .	14
Dropped from the roll at their own request,	4
Leaving now on the roll a membership of .	96

The Association has held seven meetings during the year with an average attendance of twenty members. No excursion or field meeting was held.

Respectfully submitted,
GEO. L. COOPER,
Recording Secretary.

Treasurer's Report.

G. H. Wilson, To Meriden Scientific Association, Dr.:

Jan.	1.	To Cash on hand	$17.63	
"	1.	To Cash Received	27.00	
				$44.63
		Cr. by Bills Paid		23.65
1894—		To Balance on hand		$20.98

Report of Curator and Librarian.

The following have been received by exchange or presentation since our last report:

Report of Johns Hopkins University, 1892-1893.

Report of Central Park Menagerie, 1892-93.

Report of U. S. Chief of Ordnance, 1892-1893.

Report of Chief Signal Office, 1892-1893.

Report of U. S. Geological Survey, 1892-1893.

Report of Smithsonian Institution, 1892-1893-.

Report of Royal Cornwall Polytechnic Society, Falmouth, 1892-1893.

Report of American Museum of Natural History, Central Park, 1892-1893.

Report of Zoological Society of Philadelphia, 1892-1893.

Report and Proceedings of Belfast Naturalist Field Club, 1892-1893.

Report of Curators of Museum, Wesleyan University, 1892-1893.

Report of State Mineralogist of California, 1892-1893.

Bulletin of Torrey Botanical Club, 1892-1893.

Bulletin of Minnesota Academy of Natural Sciences, Vol. IV.

Bulletin of Scientific Association, Peoria, Ill., 1892-1893.

Bulletin of Essex Institute, 1892-1893.

Bulletin of American Geographical Society, 1892-1893.

Bulletin of Washburn Laboratory of Natural History, Topeka, 1892-1893.

Bulletin of American Museum of Natural History, New York, 1892-1893.

Transactions of Academy of Science, St. Louis, 1892-1893.

Transactions of the Wagner Free Institute of Science, Vol. III, 1892-1893.

Transactions of Geological Society of Glasgow, 1892-1893.

Transactions of Academy of Sciences of New York, 1892-1893.

Transactions of Royal Society of Cornwall, Penzance, 1892-1893.

Transactions of Academy of Sciences, Kansas, Vol. XII.

Proceedings and Transactions of Natural History Society of Glasgow, 1892-1893.

Proceedings of Colorado Scientific Society, 1892-1893.

Proceedings of Natural Science Association of Staten Island, 1892-1893.

Proceedings of Canadian Institute, Toronto, 1892-1893.

Proceedings of Davenport Academy of Sciences, 1892-1893.

Proceedings of Natural History Society of Wisconsin, 1892-1893.

Proceedings of California Academy of Sciences, 1892-1893.

Proceedings and Transactions of Royal Dublin Society, 1892-1893.

Proceedings of Folkestone Natural History Society, 1892-1893.

Proceedings and Transactions of Nova Scotia Institute of Natural Science, Vol. IV.

Proceedings of Belfast Natural History and Philosophical Society, 1892-1893.

Abstract of Proceedings of the Geological Society of London, 1892-1893.

Memoir and Proceedings of Manchester Literary and Philosophical Society, 1892-1893.

Journal of Elisha Mitchell Scientific Society, 1892-1893.

Journal of Liverpool Polytechnic Society, 1892-1893.

Journal of New York Microscopical Society, Vol. VII.

Journal of Royal Institute of Cornwall, Texas, 1892-1893.

Journal of Cincinnati Society of Natural History, 1892-1893.

The Academy of Sciences of St. Louis, 1892-1893.

Colorado College Studies, 1892-1893.

Johns Hopkins University Circulars, 1892-1893.

American Ephemeris and Nautical Almanac, 1893.

West American Scientist, 1892-1893.

Ornithologist and Oologist, 1829-1893.

The Nautilus, 1892-1893.

United States Geological Survey, 1892-1893.

FOREIGN EXCHANGES.

Memoire Della R. Accademia Dell Scienze Dell' Institute di Bologna, 1892.

Bulletino Mensile della Academia Gioenia di Scienze Naturali, Catania, 1892-1893.

Atti e Rendiconti della Academia Medico-Chirurgica di Perugia, 1892-1893.

Atti della Societa Toscana di Scienze Naturali, 1892-1893.

Alla Memoria del Prof. Giuseppe Meneghini. Pisa, 1892.

Programma del Regio Instituto Tecnico Superiore di Milano, 1892-1893.

Annali del R. Instituto Tecnico Antonio Zanon in Udine, 1892.

Sitzungsberichte der Naturforchenden Gesellschaft zu Leipzig, 1892-1893.

Verhandlungen der Naturhistorischen Vereines der Preussischen Rheinlande, etc.. Bonn, 1892-1893.

Programm der Technischen Staatslehranstalten zu Chemnitz. Osteen, 1892.

Jahresbericht der Naturforschenden Gessellschaft in Emden, 1892-1893.

Fuhrer durch das Kgl. Mineralogisch-Geologische und Prachistorische Museum zu Dresden, 1892.

Abhandlungen Herausgegben vom Naturwissenschaftlichen Vereins zu Bremen, 1892-1893.

Monatliche Mittheilungen Gesammtgebiete Naturwissenschaften, Frankfort, 1892-1893.

Annalen des K. K. Naturhistorischen Hofmuseum. Wien, 1802-1893.

Jahresbericht der Geographischen Gessellschaft zu Griefswald, 1892-1893.

Vierundzwanzigster Bericht der Oberhessischen Gesellschaft fur Natur-und Heilkunde. Giefsen, 1892-1893.

Verhandlungen der Naturforschenden Gesellschaft in Basel, 1892-1893.

Jahresbericht der Vereins fur Naturwissenschaft zu Braunschweig, 1892-1893.

Korrespondenzblatt des Naturforscher-Vereins zu Riga, XXXII, 1893.

Jahresbericht der Technischen Staatslehranstalten zu Chemnitz. Ostern. 1893.

Jahresbericht der Naturhistorischen Gesellschaft zu Hanover, 1802-1893.

Anzeiger der Kaiserlichen Akademie der Wissenchaften, XXVI, Jahr, 1893.

Fetschrift zur Feier des Funfundzwanzigjahrigen Bestchens des Naturwissenschaftlichen Vereins zu Bremen, 1893.

Bericht Oberhessischen Gessellschaft fur Natur-und Heilkunde, Giefsen, 1893.

Verhandlungen des Botanischen Vereins der Provinz Brandenburg. Berlin, 1892-1893.

Register Uber die Verhandlungen des Botanischen Vereins der Provinz Brandenburg. Band 1, XXX, 1892-8893.

Annales Societe Linnernnee de Lyon, 1892-1893.

Questionnaire de Sociologie et d'Ethnographie. Paris, 1892-1893.

Bulletin de la Societe Zoologique de France. Paris, 1892-1893.

Bulletin de la Societe. Vaudoise des Sciences Naturalles, Lausanne, 1892-1893.

Bulletin des Seances de la Societe Entomologique de France, 1892.

Bulletin de l'Institut National Genevois. Tome, XXXIX, 1892.

Memoires de l'Institut National Genevois, 1892-1893. H. & L. Siret. Bruxelles, 1892.

Lois, Statuts et Reglements concernant les Anciennes Academies et l'Institut, de 1892 a 1893. Paris, 1893.

Societe Botanique de Lyon. Bulletin Trimestrial, 1893.

Congres International des Sciences Ethnographiques. Paris, 1893.

Societatum Litterae, 1893. Frankfort.

Acta Societatis Pro Faunna et Flora Fennica, 1892-1893. Helensingfors.

Meddelanden af Societatis Pro Fauna et Flora Fennica, 1892-1893. Helsingfors.

Notae Conspectus Florae Fennicae Auctore Hjalmar Hjelt. Helsingfors, 1893.

Herbarium Musei Fennici, 1, Plantae Vasculares. Helsingfors, 1893.

Archives Musee Teyler. 1892-1893. Harlem.

Fondation Teyler. Catalogue de la Bibliotheque. 1892-1893. Harlem.

Communicacoes da Commissao dos Trabalhos Geolocos de Portugal. Lisbon, 1892-1893.

La Naturaleza, Periodico Cientifico de la Sociedad Mexicana de Historia Natural. Mexico, 1893.

Liste Systematique des Publications de l'Institut Royal Geologiqne de Suede. Stockholm, 1893.

Bihag till Kongi. Svenska Vetenskaps-Akademiens Handlingar. Stockholm, 1892-1893.

Entomologisk Tidskrift, 1892. Stockholm.

Praktiskt Geologiska Undersokningar inom Jemtlends Lan. Stockholm, 1892-1893.

Om Lias I Sydostra Skane. af Joh. Chr. Moberg. Stockholm, 1892.

Sveriges Geologiska Undersokning. Ser. C. Nos. 93-115.

Om Granitindustrien I Utlandet Sarskildt Storbritannien. H. Lundbohm. Stockholm, 1893.

Om Apatitens Forekomstaatt I Norbottens Lan. af G. Lofstrand. Stockholm, 1893.

ANNUAL ADDRESS.

Mr. President, Ladies and Gentlemen:

We meet to-night to review the year; to see what has been doing in this and other associations.

And, first, in this.

We have held seven public meetings, for hearing papers and listening to lectures and addresses—these I will now review in their calendar order.

April the 11th. Our President presented a paper on *Scientific Hoaxes,* and our Vice President, gave a timely and interesting talk on the *Islands of the Pacific,* with especial reference to Hawaii and New Zealand, "islands in which Meridenites ought to be interested, for Meriden furnished an interpreter once for old King Kamehamena, and has now among its citizens a missionary from New Zealand." Then Dr. Davis read a very able paper upon the Evolution of the Human Face, which was followed by Dr. Wilson in some very practical remarks upon Pork Inspection for the discovery of Trichinæ, as ordered by the U. S. government.

May 9th. Mr. Pettee spoke upon the observations of the recent total eclipse made in South America; Mr. Cooper described some recent inventions in physics, especially the Lumistat, a device for completing the electric circuit by the action of light-rays on a blackened disc; Professor Frost accounted for the extinction of the wild pigeon, once so common in New England, by the destruction of the beech-forests which supplied them with food ; and Dr. Wilson read a paper upon the great benefit of forests to communities, and paid just attention to the West Peak section of Meriden, in its relations to our local water supply, with reference to both its purity and abundance. Mr. Pettee also sent up, to be read by the secretary, a very interesting account of Miss Klumpke, a California girl, who has recently been added to the corps of astronomers in the Paris Observatory ; who bids fair to rival Miss Caroline Herschel, and Miss Maria Mitchell. Already a Bachelor of Science, and soon to be admitted to the Doctorate, her zeal and intelligence have won for her a highly privileged position in the Observatory. She is the first woman ever admitted, as a working astronomer, to this institution, and with a twenty-foot equatorial, is already doing the work of an able and experienced astronomer.

June 13th. Mr. Pettee read an astronomical paper, and remarked upon the recent total solar eclipse, also offered remarks upon sun-spots, now so large and numerous. Mr. George L. Cooper read a paper on the Mechanical Equivalent of Heat. He cited many partially correct theories of early philosophers from Plato to Locke and Bacon. He went on to review at length the experiments of the late Prof. Joule by which the mechanical equivalent was empirically established, showing drawings of some of his later apparatus. He then took up the mathematical work, synchronous with, but independent of, Joule's, done by Meyer, of Heilbrom, and repeated his more important calculations on the blackboard. Glancing rapidly at the results obtained by Mohr, Golding, Sequire and Sadi-Carnot, be explained the kinetic theory of heat motion, and went over Prof. Tyndall's deductions of the absolute zero of temperature. Mr. Cooper closed with a rosy picture of the future of scientific discovery.

Dr. Davis read a paper supporting Mr. Cooper's position, and Mr. Frost congratulated Meridenites that a Meriden boy, Hugh Lee, had been selected as one of Lieut. Peary's Arctic expedition.

Sept. 12th. Mr. Pettee spoke of Rordame's comet, of which he had obtained three good views ; and which astronomers with larger telescopes had since found to be double—one comet in the tail of another ; of the Occultation of Antares, which he observed the 23d of July; of a magnificent meteor which fell near Suffern, N. Y., making a hole in the ground four feet in diameter, and scorching everything around it; of a meteor observed in Austria, which went up instead of down, passing the earth and disappearing in the higher regions of the atmosphere, the only case of the kind recorded; he also spoke of the total solar eclipse of the 16th of April, as having been successfully observed at all the astronomical stations; and again of sun-spots, which the last summer had been unusually large and numerous, and which he thought might have had some connection with our recent violent storms. Prof. Frost read an able and beautiful paper upon the Extinction of the Wild Pigeon, the subject on which he talked at the May meeting. Dr. Wilson followed with able and interesting remarks upon Sewage, with special reference to the system adopted by the Columbian Exposition; Mrs. Guy read valuable extracts descriptive of strange flesh and fish-eating plants found in China and Nicaragua; Dr. Davis read an able paper upon the origin of the Aryan and Indu-European races; and Mr. Cooper described the recent experiments of Mm. Legrange and Soko, and of M. Moissan in producing temperatures of from 3,500° C. to 4,000° C. These results he said were obtained by connecting a lead vessel with one of the poles of a powerful dynamo, filling the vessel with water, and inserting in it a piece of metal connected with the negative pole of the dynamo. By decomposition a film of highly resistant hydrogen is formed around the metal and the current is so interrupted as quickly to raise the metal, no matter how refractory, to the fusing point. He also described the apparatus and experiments of Mm. Dielet and Dewar at Geneva, by which a temperature of minus 250° C., and possibly lower, was obtained.

October 9th. At this session the gentleman who was expected to entertain us being ill, the President submitted a paper on the Sun's Distance as derived from various transits of Venus, and what was of more interest, because it had not been reported to the Association before, the parallax of the last transit, as determined by Prof. Harkness, (8.842",) which he had just received from the learned Professor, which makes the sun's distance 92,440,000 miles.

Mrs. Francis Guy contributed to the interest of this meeting by exhibiting, and describing the habits of, a beautiful chameleon.

November 13th. It was expected that Dr. Wilson would have filled up this evening with a lecture on the Polariscope. so the members were not prepared to entertain the audience; but the President, who happened to have some astronomical papers in his pocket, made a brief report, remarking as he rose, that he had a longer paper, which the Association could have, if the members desired it. His report concerned but two things, the completion of the Observatory on Mt. Blanc, and an important discovery (No Oxygen in the Sun) already made there. The Observatory, he said, was 15,000 ft. above the sea, (about three times as high as the Lick Observatory on Mt. Hamilton; second in altitude only to the Harvard Observatory on the Peruvian mountains, which is over 16,000 ft.,) built, not on the rock. but on the ice, or frozen snow. The French engineers found it impossible to dig down to the solid rock, the ice was so hard, so, to provide for that perfect level which is essential in all observatories, they rested their work on ten immense jack-screws, so that the observatory can be jacked up, if necessary, for every observation. The discovery, No Oxygen in the Sun, will be referred to later. Mr. Pettee's longer paper being called for was then read; it was entitled, *Astronomy, the Grand Corrector of Chronology*, in which he characterized astronomy as "the unerring calendar of the skies," and showed that, wherever historians have associated historic events with eclipses, transits, occultations, or other astronomical phenomena, the date of these events can be fixed unerringly; as these phenomena can be calculated back as well as forward. In this way, the speaker said, (following a very able lecture of Prof. Legge before the Victoria Institute, or Philosophical Society of Great Britain, (of which Mr. P., by recent invitation, had become an Associate,) the dates of Chinese history have been verified with certainty up to 842 B. C., and with great probability, up to 2165 B. C.

December 11th. This evening was given to Mr. Edson Sanford, an honored member of the Association, who entertained us with a lecture on Parisian Art, illustrated with statuettes brought from Paris. All were beautiful, but a group, which we afterwards learned was designed by Mr. Sanford himself, though modelled by Mr. Theodore Bauer, formerly of Meriden, we thought the best of all.

Thus, friends, I have rapidly run over the meetings of the year, and you can judge for yourselves whether we have wisely improved our time as members of the Meriden Scientific Association.

Now we will take a general survey, and see what has been going on the last year in the scientific world. And here, at the outset, a fact confronts us, not cheerful to contemplate, 1893 was not a good scientific year; by which I mean it was not a year crowned by many great scientific discoveries. There is, you know, a difference. Some years great discoveries crowd upon us fast enough to take our breath away; other years none worth reporting. Some years the hosts of science make visible breaches in the wall of ignorance which surrounds us; others, resting on their arms, they seem to be gathering strength for fresh onslaughts. The last has been a year of resting; the next we hope will be a year of onslaughts.

ANTHROPOLOGY.

In this section I have heard of no startling discoveries. From *Science*, March 10, I learn that "The University of Zurich possesses the rare treasure of five skeletons of members of the Alakuluf tribe in Terra Del Fuego. It seems these wretched islanders were taken to Europe to show in Museums, and by some strange fatality all died at Zurich of pneumonia. Dr. Rudolf Martin has worked up their osteology, and published the results. He finds the skulls well shaped, and on the whole, larger than the skulls of the average Parisian. This suggests several questions. Has man increased or diminished in stature since he first appeared upon the earth? Have his bones increased or diminished in solidity and weight? Have the relations in these respects between the two sexes always been as they are now? These questions, I think, are well answered by Dr. J. Rahon in a recent paper in the Memoirs of the Anthropological Society of Paris. His conclusions may be briefly stated. Comparing the earliest quarternary skeletons found in Western Europe, with those of the present population, he finds that the former belonged to what we should call medium-sized people, with an average stature in the males of 1.63 meters (5 ft. 3½ in.) The tribes of neolithic times varied scarcely at all from this measurement; but the proto-historic nations, the Gauls, Franks, Burgundians, etc., ran the figures for men up to 1.66 meters (5 ft. 4.6 in.). Since their epoch it has been, though slowly, descending in France, until the average of the Parisian men of to-day is 1.62 meters (5 ft. 3 in.), a trifle less than quarternary man. In all ages, the women have averaged about ten centimeters (4 in.) less in height than the men. The bones of both were rather heavier and stronger in ancient times.

DOLMANS, CROMLECHS, OR MENHIRES.

Connected with those megalithic monuments, in certain parts of France, there are some superstitious practices which preserve a singular vitality. There are places where sick people, or people with diseased limbs, are passed through the holes in certain stones. In other places they are slipped in between a sacred stone and the ground. Christianity, I am sorry to say, has often put its imprint on these superstitious practices, by substituting for the stone, the object of Pagan belief, a table covered with relics, or the flat stone of a saint's tomb.

ANCIENT GRAVEYARDS.

It is painful to see, while we so venerate our own cemeteries, how ready we are to desecrate the cemeteries of the ancients.

Some fourteen centuries ago 500 peaceful Huns were buried in a cemetery at Cziko in Hungary. Recently that cemetery was discovered; and instead of enclosing and preserving it as something sacred, the discoverers opened the graves, and gave over their contents to relic hunters. And, since they did this, perhaps there will be no sin in seeing what these ancient graves contained.

In seven graves, probably those of warrior chiefs, the remains of horses have been found buried with their owners, with their harness complete, and adorned with silver or bronze work. On the skeletons of these chiefs a number of very skillfully-made ornaments have been discovered, including, for instance, belts of silver and bronze. The weapons are knives, arrowheads, three-edged javelins, spear points, and axes. Several of these chiefs held in their left hands Roman coins belonging to the end of the fourth century.

Among the food found in the graves there were a number of eggs with shells still unbroken. Equally interesting is the fact that in several graves a Roman stilus was found, showing that the Huns of that period were more cultured than had hitherto been believed. One of these stili was artistically made of silver, and richly ornamented. It was found in the hand of a woman, with a wax tablet close by, ready to be written on, showing that woman was not so degraded, nor the Huns so uncivilized fourteen hundred years ago as we sometimes suppose. Nearly all the women have massive golden earrings, fibulæ, and armbands, besides knives, hand glasses, and various ornaments of silver, amber, bronze, and glass. The objects discovered at Cziko promise to be of the greatest archælogical interest.

A cemetery, much more ancient, has since been discovered at Salamis, an island in the Mediterraneum, and now fresh desecrations will be in order.

ARCHÆOLOGY AND ETHNOLOGY.

In a field so extensive as this we only notice a discovery here and there. Egypt, as usual, continues to "give up its dead," while Palestine and Assyria are making their usual contributions to antiquarian knowledge. But these are so well set forth in those excellent monthlies, "*Biblia,*" and "*Biblia Illustrated,*" published, we are proud to say, in Meriden, and by the Corresponding Secretary of this association, that I need not, perhaps, regret my want of time and space to spread them before you. Every member of the association should take the *Biblia* and read these things for himself. And here let me say, unknown to the publisher, there will soon be issued from the office of the *Biblia* a most remarkable book, the "*Egyptian Book of the Dead.*" This was found, written on rolls of papyri, in the tombs of Egypt, and is one of the oldest books ever written.

I may, however, mention a collection of Egyptian papyri, recently purchased by subscription for the Geneva Public Library, and which is now being translated by M. Jules Nicole. They are not as old, by many centuries, as the last papyri mentioned, but M. Nicole has already discovered in them fragments of the Illiad & Odyssey, portions of the XI and XII books, with great variations from the accepted text; a passage from Euripide's "Orestes" a thousand years older than any manuscript hitherto known; a didactic elegy on the stars, an idyl on Jupiter and Leda, and historical and scientific compositions. In Christian literature there are liturgical passages, portions of the Bible, with or without commentary, and later documents on Eastern Church History. There is also a letter from a Bishop or Superior of a monastery, to the postal authorities |which asks for horses to be provided for three months, for the use of the monks in traveling, "for they are orthodox." I may also notice a remarkable find by Mr. Petrie, at Tel-el-A-mana,

THE CAST OF KHUENATEN'S FACE.

Khuenaten was the great reforming Pharaoh who left such a deep impress upon the religion and art of Egypt.

Says Mr. Petrie, "The character of the man, and the real objects of his revolution in religion and art are greatly cleared by our now being able to see him as in the flesh. By an inexplicable chance there was lying on the ground among some other stones, a plaster cast taken from his face immediately after his death, for the use of the sculptors of his funeral furniture. The cast is in almost perfect condition, and we can now study his face, which is full of character. There is now trace of passion in it, but a philosophical calm, with great obstinacy and impracticability.

He was no vigorous fanatic, but a high-bred theorist and reformer: not a Cromwell, but a Mill. No such cast remains of any other person in ancient history.

And here a word on Egyptian sculpture and printing. When we open a book of Egyptian antiquities we are often disgusted, and sometimes shocked, with their horrid caricatures; and we ask ourselves is this the best that this highly civilized people could do in sculpture and painting? But we forget that these are *conventional.* They were never designed to represent human beings, much less particular individuals. In their earlier dynasties the Egyptians copied nature, painted and carved the real faces of men and women; but in the later dynasties they adopted a conventional style, just as the monks of Europe did in the middle ages, and as the monks of Mt. Athos do to-day, in their church paintings. Hence the stiff and awkward, and sometimes, monstrous figures we see in our churches. We should remember this when looking at these Egyptian figures. They were not designed to represent anybody—not even human beings; they were conventional. But there are both portraits and statues which have come down to us from the earlier dynasties which would not disgrace the art galleries of the present day.

NEWER DISCOVERIES.

Prof. Sayce says, in the Academy, London, April 8, I have come upon a new fortress, or palace of the High Priest, Men-Kheper-Ra, the co-temporary of the Twenty-first Dynasty. The building is a large one, and was constructed of kiln baked bricks, stamped with the cartouches of Men-Kheper-Ra, the high priest of Ammon.

At Mashashdah, opposite Dishneh, and to the south of Han, a new burial place, of the time of the Old Empire, has been discovered by the fellahin. Among other objects that have come from it, are some very fine scarabs with the name of Pepi I, of the Sixth Dynasty. These are very ancient, at least 6,000 years old.

I will only add that a hitherto unknown oasis is said to have been discovered at a distance of five days on camels from Siut, and that temples and inscriptions are reported to exist there in a good state of preservation."

Who can tell what these temples will disclose and what treasures of ancient history these inscriptions will give to the world!

The following I add on the authority of the Philadelphia Press, concerning Nebuchadnezzar's doorstep. You remember the story of his insanity, and how he was turned out to grass, as recorded in the Bible, and here we have the story told on his doorstep:

In the Egyptian and Assyrian gallery of the British museum and in close continguity to the Hittite monuments and the bronze gates of Shalmanezar may be seen an object of more than ordinary interest—a very common looking bronze doorstep from the great temple of E-Laggil at Borsippa, a suburb of Babylon. This doorstep, ordinary as it appears, is of great historical value, as it not only has the name of King Nebuchadnezzar inscribed upon it, but also mentions his restoration to health and power. It is no doubt a native offering and an object of great antiquity.

This brings us to

CHALDEA AND MESSOPOTAMIA.

The archæologist has found much the last year, to reward him in these regions, M. Le Sarzac has made a very interesting find in a royal palace of Ancient Armenia, a *Collossal Spear Head*, made of copper-bronze, 31½ inches in length, 5½ inches in breadth.

"At the point of the spear-heard is engraved a lion with claws in the position of attack. Below is an inscription which, however, gives no clew to the former owner of the weapon. Learned archæologists who have examined the lance-head are of the opinion that it was once carried by Isdubar, the Chaldean Hercules."

Nor would we pass

THE RUINS OF SINJILI.

Dr. Von Lushen, the director of the three expeditions to Northern Syria, made by the Oriental Museum of Berlin, has published a partial report of his explorations; and the name of Sennacherib, Esar-Haddon, and Tiglath Pileser, occur so frequently on the monuments he unearthed, and in the inscriptions he transcribed, that in reading them we seem to be reading the historic books of the Bible. They confirm the historic scriptures in every way in which confirmation is possible.

I learn from the 26th Vol. of the Transactions of the Victoria Institute, from a very learned and able paper recently presented by Theo. D. Pinches, Esq., that important excavations are being made at Tell-Loh, a mound of ruins midway between the Tigris and the Euphrates, on an ancient canal connecting these two rivers. I have not time to dwell upon the finds made there, nor their bearing upon Scripture or history, but will only say that the tells of Assyria, in the antiques they turn out, are fairly rivaling the tells and the tombs of Egypt.

I am sorry however to see that so much uncertainty attaches to the cuneiform inscriptions.

When Assyriologists shall read the cuneiform with as much certainty as Egyptologists do the Egyptian, Assyria will make contributions to ancient history second only to those already made by Egypt.

The ruins in Mashonaland and Zimbabwe in South Africa, have attracted much attention, though, I believe, no inscriptions have been found to tell to what people they belonged—evidently to a war-like people, for the ruins consist mainly of immense fortifications.

A BURIED CITY IN GUATEMALA.

A buried city has recently been discovered in Guatemala, in which were found onyx axes, hammers, saws, knives and lance-heads; in fact the whole series of weapons in use in Pre-Columbian times. And, sad to relate, incontestible evidence that the city was destroyed by an earthquake; for, at the level of the floor of the house was discovered a confused mass of human skeletons, and it is almost startling to read that some of them were six feet seven inches in height.

And here is a prehistoric city just unearthed in Colorado. Says a correspondent writing from San Diego, Cal. July 24:

"The ruins of a pre-historic city were discovered by a party of prospectors from Yuma, when on the Colorado desert in search of the Pegleg mine. The wind had laid bare the walls and the remains of stone buildings. For a distance of 420 feet by 250 feet in width, gigantic pillars, quaintly carved to represent dragons' heads and rattle snakes, stood in the sand of the desert supporting on their tops huge slabs of granite weighing many tons. The frieze ornamentation resembled Egyptian sculpture and exhibited a greater degree of skill than is possessed by the Indian artisans of the present day.

Fragments of pottery were found underneath the debris, and together with the crumbled pieces of the frieze were brought by one of the prospectors to this city."

But what is regarded by archæologists as the most important archæological find of the year is that made by Dr. J. Nuesch, at Schaffhausen on the Rhine, at a place called Schveitzerbildes. "Here he has discovered the remains of a human settlement, which is of the greatest importance to archæology, the find equalling, and, indeed, exceeding all previous discoveries of its class, in beauty, variety, and typical rarity of the several articles; and deserving universal interest all the more from its great antiquity, which extends into the diluvial period, certainly to upwards of four thousand years before Christ."—*Dr. C. M., in Ueberland und Meer.*

MAMMOTH AND MAN.

It has been a question among archæologists and anthropologists whether man and the mammoth existed on earth at the same time. The weight of opinion hitherto has been that they did not. What shall we say, then, of a statement of Dr. Nuesh like this concerning a limestone tablet which he found at Schaffhausen: "It has on it clear and well depicted drawings of reindeer, horse, and foal, and, besides these *a mammoth meets the astonished gaze:*"—

What shall we say of it? Just what we would say of the delineation of a mammoth on a bone from the Lena cave in the south of France, found some years ago, and of two delineations of the same kind, since found in the valley of the

Delaware River, *that it proves conclusively that Man and Mammoth existed on the earth at the same time.*

COIL POTTERY.

I have been very much interested in reading an article in "Science," contributed by Mr. Henry Hales, from which I learned that this kind of pottery is found in the mounds of Florida and Ohio, in the Cliff Dwellings of New Mexico and Arizona, in the buried cities of the canyons of these Territories, in the Connecticut Valley, and under the ancient shell-heaps of Cape Cod, Mass. It was made by rolling clay into long, string-like cords, and while soft, beginning with one end to coil it round and round, thus making the bottom, then shaping it up the sides, (just as straw hats are made), till the required form and size were attained.

These pots or pitchers are found scattered all the way from Cape Cod to Arizona. What a period of time they indicate! How long it must have taken to have this coil pottery distributed over so vast an area! What do *we* know of the real aborigines of this country; those who inhabited it thousands of years before Eric the Red, or Leif Erickson, carried lumber and grapes from the shores of New England.

It would seem from the following, clipped from a western newspaper, that horses as well as birds have left "footprints on the sands of time:"

"Petrified horse tracks" are among the curiosities attributed to Missouri. They are said to be found in the bottom of a creek in Ray County. The ancient bird tracks of Connecticut thus have present-day rivals.

AN ANCIENT CANAL IN THE CRIMEA,

which Melnikoff, the Russian engineer, regards as one of the wonders of the world. This canal, he says, was built by Asander I. of Bosporus, in the Seventh Century B. C., and is mentioned in the writings of both Pliny and Strabo. Its length is nine kilometers, (about 5½ miles), its width at the bottom 5 meters (about 16½ ft.) and its depth ten meters (nearly 33 ft.)—large enough to float ships of that period, so that it may be called a ship canal—straight as an arrow, lofty castles at each end, six intermediate towers—of such massive construction, that it shames canals of modern times.

This is a very interesting find, but I very much doubt the high antiquity which Melnikoff assigns it. Unless Strabo speaks of it as very ancient, I should be inclined to place its construction in the first century of our era, for Asander was restored to his throne by Augustus Cæsar, and the Kingdom of Bosporus had no existence till about 500 B. C. But while we doubt its antiquity, no one can doubt the massiveness of its construction; like the Pyramids of Egypt, that speaks for itself.

THE ANCIENT NAMES OF GREAT BRITAIN.

Arbois de Jubainville, is very happy we think, in giving in the Revue Archeologique, the origin of the name Great Britain. The oldest form of the name of Britain is Ortanis, from which comes the adjective Ortanicos, which in Irish is Cruitnech. This last is the name which the Irish gave to the Picts, once masters of Great Britain. The adjective mentioned became in the language of the Gauls Pretanicos. Pythias, the Greek Navigator of Marseilles, who flourished about the time of Alexander the Great, and is said to have made a voyage to Britain, in one of his few fragments now extant, calls Great Britain the Pretanic Island. A century after Pythias, a Gallic people—the Brittani—drove the Picts out of Great Britain, and established themselves there. From this came confusion in the minds of Greek geographers between the names of the conquerors, and that of the conquered island. Out of this confusion arose various and mixed forms. The Pretanic Island became Bretanic, and then Britannic, which form became fixed, and has come down to us.

ASTRONOMY.

Astronomy is an old science, and, like an old horse, extremely slow. You will not then be surprised to learn that there have been no very great astronomical discoveries the past year. There have been the usual number of comets picked up, most of them telescopic, but one of these a naked eye comet; *i. e.*, you could see it with the naked eye, if you knew just where to look for it.

That was Rordame's comet, discovered at Salt Lake City by Alfred Rordame, the eighth of July. The most singular thing about it was that, when approaching the sun, it developed two tails, and, as before mentioned, the strange spectacle was presented, of one comet towing another. The others have been mere telescopic comets, of interest only to astronomers. And yet, perhaps, I ought not to say that. Every newly discovered comet is of interest, for this reason; we don't know but it will come nearer, and be larger than any comet we ever saw. That splendid comet which blazed in our eastern sky in the spring of '82, when first found by the telescope was but a faint spec, but when it loomed up in the east it was worth a voyage to Europe to see.

For the comfort of those who did not see it I would say it will return again in 800 years.

AT THE LICK OBSERVATORY.

Some important discoveries have been made with the spectroscope. Professor Campbell has trained the big equitorial with its spectrum attachment on the comet and has established the fact that the comet is composed of incandescent carbon and nitrogen, being itself luminous. Some interesting work has been done on bright line stars, the big telescope flashing through the spectroscope many new lines that indicate unsuspected elements in these stars. The new star Nova Aurigæ has been proved a nebulous body as the spectrum shows the same features as the spectrum of nebulous stars. The best discoveries at the Lick observatory have been made by aid of the spectroscope applied to the great equatorial.

And, I would add, most astronomical discoveries are now made with the spectroscope. The chemical plate has advantages over the human retina, because it is sensitive to rays which the eye does not appreciate at all. It is even possible to photograph objects "so faint as to be altogether beyond the power of any telescope to reveal, and we may thus eventually learn whether a blank space in the sky truly represents the end of the stellar universe in that direction, or whether further and further worlds roll and shine beyond, veiled in the obsurity of immeasurable distance."

And here is another discovery made by a woman. Mrs. M. Fleming, the chief examiner of the Harvard observatory, has the credit of bringing the find to the notice of the observatory people.

She was looking over a number of plates which recently arrived from the observatory at Peru, when a spectrum caught her eye unlike anything she had seen before.

A diligent study of other plates showed that the object discovered was a new star.

And here is a fancied discoverer of

A NEW CRATER IN THE MOON.

In a bulletin of the Astronomical society of the Pacific, Professor Weinek, director of the observatory of Prague, who is a specialist in the study of the moon and to whom have been sent copies of the Lick negatives of the moon, has discovered in one of the Lick photographs a crater which is not to be found on Schmidt's map. This object, which is estimated to be about a quarter of a mile in diameter, is of sufficient size to have been seen by Schmidt, and it is difficult to imagine that the distinguished selenographer overlooked it.

I should say that it was; and I don't believe he did. It would be easier to imagine some error in studying the Lick negative, than to suppose that as careful an observer as Schmidt overlooked a lunar crater "a quarter of a mile wide."

I find in the Nineteenth Century an article on Ancient Egyptian Astronomy which I think will interest you.

ASTRONOMY IN EGYPT.

We find in the table at the Ramesseum distinct references to the bull, the lion and the scorpion, and it is also clearly indicated that at that time Sirius rose heliacally at the beginning of the rise of the Nile.

This word heliacally requires a little explanation. The ancients, who had no telescopes and had to use their horizon as the only scientific instrument which they possessed, were very careful in determining the various conditions in which a star could rise. For instance, if a star was rising at the same time that the sun was rising, it was said to rise cosmically, but unless certain very obvious precautions were taken the rising star would not be seen in consequence of the presence of daylight.

It is quite clear that if we observe a star rising in the dawn it will get more and more difficult to observe the nearer the time of sunrise is approached. Therefore what the ancients did was to determine a time before sunrise in the early dawn at which the star could be very obviously and clearly seen to rise. The term "heliacally rising" was coined to represent a star rising visibly in the dawn—therefore before the sun. Generally throughout Egypt the sun was supposed to be something like 10 degs. below the horizon when a star was stated to rise heliacally.

We find then that more than 5,000 years ago the Egyptians were perfectly familiar with these facts, and the difference between a cosmical and heliacal rising was perfectly clear to them. But the table at Thebes tells us, moreover, that the sun's journey in relation to some of the zodiacal constellations was perfectly familiar 5,000 years ago.

The various apparent movements of the heavenly bodies which are produced by the rotation and revolution of the earth and the effects of precession were familiar to the Egyptians, however ignorant they may have been of the causes. They carefully studied what they saw and attempted to put their knowledge together in the most convenient fashion, associating it with their system of worship. And what is here said of Egyptian astronomers, is equally true of the Chaldean and Chinese astronomers.

THE CANALS OF MARS.

You have all heard of the canals of Mars, those narrow bands upon the surface of the planet which appear in large telescopes, and which, I think, were well explained by Flammarion, as *ridges of land that appear at low water.*

A writer in *Die Natur*, Dr. A. Tooska, explains these ridges, which he calls mountains, in the following ingenious manner. He supposes that the planet has been in the habit of stealing the little planetoids among which it revolves, and making satellites of them. That one of these planetoids, drawn nearer and nearer by the planet's attraction, and revolving faster and faster, as it necessarily would, finally struck its surface at a low angle, and ploughed a furrow across it, throwing up a mountain ridge on each side; and he is led to this conclusion by, what he claims to be a fact, that the smallest of its present two satellites, Phœbus, is coming nearer, and revolving faster, at each revolution, and will at no distant day, plough up the planet again. All I have to say is that, if it does, it will by its impact set the planet on fire—and I don't see why the first ploughing didn't set it on fire, and burn up all upon it—Prof. Hall must look out for his unruly satellites. The theft theory I don't object to. I always supposed that Mars stole those two little satellites; and if the theft occurred recently, it may account for a fact that has sometimes puzzled me. That they had never been discovered before—except of course by the astronomers of Lilliput.

Let us turn now to a larger moon, even our own fair Luna, and inquire why it has no air. Astronomers are agreed that it has none, and if they were not, a single occultation would convince us of the fact. Why then has the moon no atmosphere? Sir Robert Ball answers in *Science*, Feb. 24. He says, "The absence of air from the moon is the necessary consequence of the kinetic theory of gasses. According to the principles of this theory, now generally accepted among scientists, any gas such as oxygen or hydrogen, is composed of molecules which move with an extreme degree of rapidity; hydrogen more than 6000 ft. a second. It can be shown that the mass and the dimensions of the moon are such that if a body were projected upward from its surface at the rate of a mile a second, then the missile, according to the laws of motion, would ascend from the surface of the moon and go on and on, never to be again recalled by any power that the moon's attraction could put forth." This certainly is an ingenious theory. But if it proves anything it proves too much, *viz.*: that the moon never had an atmosphere, for its attractive force was no greater at the beginning than it is now. What then supported its volcanic fires? Can fires burn without air? "But if the moon ever had an atmosphere, what became of it?" I answer I don't know—and I think my answer is better than Doctor Ball's.

JUPITER'S FIRST SATELLITE.

Prof. Wm. H. Pickering, of Northfield, Minn., says in *Astronomy and Astro-Physics* for March, "Upon October 8th, of the last year, I began a series of measurements with the thirteen-inch telescope, of the diameters of Jupiter's satellites. Upon the next evening, I undertook to measure the first, when at the first glance I noticed to my surprise that its disk was not circular, but very elliptical.

A brief computation the next morning showed that, if my measurements were correct, the polar flattening would correspond to a rotation period of about forty minutes, assuming a uniform density. Observations upon the next evening confirmed my first measurements. Some of the other satellites were also measured, and I then returned to my first one, when, to my astonishment, instead of showing an elliptical disc, it showed one that was perfectly circular, precisely like the other satellites. I could hardly believe my eyes, but as I continued to watch and measure, I saw the disc gradually lengthen again and assume the elliptical form, and I then understood what had really been found. The first satellite has the form of a prolate spheroid or ellipsoid, or in popular parlance is "egg-shaped." The two minor axes are approximately equal, and the satellite revolves about one of them, or, as we say, it revolves "end over end."

This I regard as one of the prettiest astronomical discoveries of the year; and all I have to say about it is, if Jupiter's satellites behave in this way, I don't wonder that astronomers have difficulty in determining their diameters, to say nothing of the fact that they are 480,000,000 miles away.

A NEW THEORY.

That eminent astronomer, J. Norman Lockyer, to account for the existence of those new stars which sometimes suddenly appear in the heavens, broaches a new theory. It is this: that they are formed by the collision of opposing swarms of meteors. And he comes to this conclusion from observing that the spectra of such stars and the spectra of meteoric swarms are identical. He is so confident in the truth of his conclusions (and no one has a better right to be confident than J. N. Lockyer, for he stands highest among spectroscopic astronomers), that he says, "It appears that carbon is one of the characteristic elements of the spectrum of new stars. Carbon is also one of the characteristic elements of the spectrum of swarms meteors. These two facts prove conclusively the theory, that new stars, whether they have any connection with nebulæ or not, are produced by the collision of meteoric swarms.

When I first read of this ingenious theory I thought I saw a weak place in it, inasmuch as meteoric swarms are flying in the same direction and would not be likely to come in collision. But when it occurred to me that these swarms were as likely to go one way as another, and that they revolved far beyond the limits of our system, I saw that the weak place did not exist, and felt quite willing to adopt the new theory; and that the more readily because it so beautifully explains the gradual disappearance of these new-made stars. They burn up.

TELESCOPES.

The great Yate's Telescope, whose lenses are forty inches in diameter, by far the largest refractor in the world, will soon be completed, and mounted at some place near Chicago. While this gives the Chicago University the largest astronomical telescope, Harvard will possess the largest photographic telescope, for the $25,000 donated by Miss Caroline Bush of New York City for this purpose has been expended, and the magnificent instrument is at last completed, and working, I believe, to the satisfaction of the makers and the users.

THE GREAT FRENCH REFLECTOR.

If we may credit Dame Rumor, the French have projected for their great exposition in 1900, a reflecting telescope 10 feet in diameter, and 140 feet in length. The mirror is to be of silvered glass, and if *polyspecular*, as we recommended in 1881; *i. e.* composed of a great number of smaller mirrors, ground to the same focus, after being fixed in a concave large enough to receive them, we see no reason why it will not work with low power eye pieces. But the tube must be constructed on the "*coude*" or elbow pattern, or the instrument will be alike unmanageable and inaccessible. It will collect an immense amount of light—20 times as much as Lord Ross's "Leviathan", and with low power, will give most splendid views of the moon and the planets.

If built on the "*coude*" principle it may do some service to astronomy. If not, it will be a great toy, like the Ferris Wheel at Chicago. "How near will it bring the moon?" That will depend upon the power of the eye-piece employed; and the power of the eye-piece upon the perfection of the mirror. If the mirror be perfect enough to bear a power of 2400, it will bring the moon within 100 miles; *i. e.* you could see an object on it just as plainly as you could with the naked eye, if it *were* only a hundred miles away. Try it (in imagination), on a large building—say, the Capitol at Washington, placed on a mountain a hundred miles distant. How large would it look? How much of it could you see—I mean with the naked eye?—You see now what great telscopes can do for the moon.

This may be a good place to introducc a note upon the antiquity of the lense. M. Edward Fourdrignier, in an article in the *Photo Club* of Paris, says: "If we are to believe C. B. Gaubil, quoted by De Paravay in his Chinese Chronology, the Emperor Chan, who reigned 2,283 B. C., used enlarging lenses in the form of a telescope in order to get a better view of the planets." We have all heard of the double-convex lense which Layard found in the ruins of Nineveh, and which Sir David Brewster said was designed for magnifying purposes (made about 700 B. C.). And now Mr. Fourdrignier says: "With regard to photography, it is certain that the application of the dark chamber and the lense, and also the sensibility of certain substances to light, were well known to the ancients."

OBSERVATORIES.

But for astronomical work the position of the observatory is quite as important as the power of the telescope. It should be built on some mountain, and as far as possible from the smoke and jar of cities. The Californians did well in building on Mt. Hamilton, 4,200 feet above the sea; the French on the Alps, 15,000 feet; Harvard on a mountain in Peru, 19,200 feet, 4,200 feet higher than the station of the French Academy on Mount Blanc. A telescope of 12 inches aperture in any of these observatories will do better work than a telescope of 20 inches on lower ground, especially if located in or near a great city.

METEORITES.

These have been as numerous as ever the past year—rather more, I think, have been reported. They are, as you are aware, small masses of matter, detached from comets or larger bodies revolving around the sun in our system. Occasionally they are drawn from their orbit by the earth's attraction, and "fall," as we say, to the surface. In passing through our atmosphere (for they come with incredible velocity), they are heated to redness, and the smaller ones are burned up before they reach the earth. These we call "shooting stars." The larger reach the earth in a highly heated state, and are called meteorites, or meteoric stones. They often explode with loud report before striking, and while in the air appear like fire-balls, flying very swiftly, and drawing behind them tails of fire. I have already spoken of one that last year passed over Austria; *that* did not strike—the attraction of the earth could not stop it, and it kept on, and visited, perhaps, some other planet. But here is one that *did* stop: I read from the Charleston *News and Courier* of December 31:

"Mr. H. H. Corbett of St. Charles, Sumter County, visited the office of the *News and Courier* yesterday afternoon to call attention to an astronomical phenomenon of which he was an eye witness. He said that yesterday morning while he was on a train on the Wilmington, Columbia and Augusta Railroad going from Sumpter to Florence, and while in the immediate neighborhood of Timmonsville, the passengers were startled by a great and sudden light illuminating the country and the interior of the car. He looked out of the window and saw in the sky, passing over the train, an object resembling the moon in size and color, but with a long, vapory tail. The object passed very rapidly in a northeast direction, but finally seemed to stand still in the sky about 15 degrees above the horizon. The tail was not steady, but assumed different shapes, at one time looking like the letter S, and at another time like the letter G, but it at last became nearly perpendicular. The object was still visible at sunrise, looking like a small moon, but the tail had disappeared."

I will only add it must have been a magnificent meteor to have been so visibly plain in the day time.

Another, weighing ten tons, was found on the 29th of November, imbedded in the soil, near Castle, Colorado. It was warm when found, showing that it had recently fallen. No one saw it fall.

These meteorites are all the time pelting the earth and falling into the sun. But who ever heard of anyone being injured by them? I never did but one—a man at the West—and the story proved to be a shameless canard. *We* can't get through the pyrotechnics of the Fourth of July without accident, but God takes good care that no one is injured by *His* fireworks.

A POINT OF INTEREST.

To biologists meteorites have a single point of interest—they sometimes contain ***black diamonds.*** I exhibited a photograph of such a meteorite in connection with my last annual, in which the diamonds were plainly visible, imbedded in the the stone. But why of interest to the biologist? Because the diamond is a product of organic life, and shows that life existed in the world from which it came. Several diamond-bearing meteorites have been found since my last, and they all tell the same pleasing story of "life in other worlds than ours."

BIOLOGY.

The Origin of Life. What *is* Life? This question was ably discussed by the members of the Victoria Institute last February, and though grave doctors, learned professors, and eminent Sir Knights of the Aristocracy, joined in the discussion, they had to conclude with Dr. Hunter that life was "that property which they did not understand," and with Huxley in his famous aphorism, "Life existed before organization, and was its cause."

BACTERIOLOGY.

The Typhus Bacillus Discovered. Professor Dr. Fraenkel, of Berlin, announces that he has discovered a typhus bacillus; and that by using this bacillus in vaccination, he has produced a rapid, benign course of fever. Professor Dr. Rumpf has cultivated an anti-fever bacillus which, he says, will cure typhus in eight days.—*Sanitarian, New York*.

We may however be more interested just now to know that, according to the *London Lancet*, of Dec. 23, a Dr. Burchettini claims to have discovered

THE BACILLUS OF INFLUENZA.

"He has succeeded," according to the *Lancet*, "in producing in rabbits, by inoculation with a bacillus which he believes to be that of influenza, a condition of absolute immunity to its attacks. He found that blood-serum from animals rendered immune rendered other animals immune also, and moreover, that it had curative properties, for, where it was injected into animals already inoculated with the bacillus and suffering severely from its effects, the temperature fell to normal, and the animals recovered, while other animals died in a few days."

THE GERM-KILLING ELEMENT IN THE BLOOD.

If Drs. V. O. Vaughn and C. T. McClintock, of Michigan University, as asserted in *Medical News*, Dec. 23, have really discovered an element in the blood which is fatal to all bacteria, and which can be separated from other elements of the blood, and be used as a virus for inoculation, they have conferred a benefit on suffering humanity.

And this is what the *News* claims they have done: "By proper chemical treatment, they have isolated from the serum of the blood of dogs and rabbits a nuclein with which they have been able to kill the germs of anthrax, cholera, and other diseases."

CHEMISTRY.

Chemists are always at work. The chemical world never slumbers. In my last annual I spoke doubtingly of an experiment of Prof. Dewar of London, by which, as it was claimed, he had liquefied atmospheric air, and exhibited it as a bluish liquid in a glass bulb. But hardly was the ink of my report dry when the wonderful experiment was more than confirmed; for the Professor had not only liquefied air, but had even solidified it.

Both results were obtained by simply lowering the temperature—in other words, producing intense cold. To liquefy required a temperature of 214 degrees below Fahrenheit's zero. The temperature required to solidify is not given—it must, however, have been above—459 degrees, as this, according to Pictet, is the lowest temperature possible—"absolute zero."

Since liquefying and solidifying air, which, as you know, is a mixture of oxygen and nitrogen, by intense cold and high pressure, Prof. Dewar has liquefied its constituents, and with his liquefied air performed many interesting experiments—among them these: Alcohol thrown on it was congested to an ice-like mass, and remained incombustible till remelted. On plunging a battery-cell into liquid oxygen, the current completly ceased, and chemical action was entirely stopped.

In one experiment the lecturer allowed the heat-rays from gas flame to pass through a bulb of liquid oxygen, and the rays being brought to a focus, the heat was so intense that paper was ignited. This was the most singular thing of all, that the heat rays were in no wise affected by passing through a region whose temperature was, at least, 164 degrees below the freezing point of Fahrenheit's thermometer. A fact that may comfort us in cold weather, for the atmosphere, however cold, can not cool the rays of the sun. You can't freeze, or even chill, sunlight.

As the matter now stands there is only one gas that has not been liquefied, that is hydrogen, the lightest of all substances; and that will, without doubt, ultimately yield to cold and pressure.*

OZONE.

What *is* Ozone? A modification of oxygen, having increased chemical activity; a colorless gas having a peculiar odor like that of chlorine. It is that in the air which makes us feel good—which makes the difference between the air of the sea shore and the mountains, and the air of a crowded city; ozone has a great power of destroying offensive odors, and is a powerful bleacher and an intense oxidizer.

But why define it? Because the last year a way has been discovered of manufacturing it in commercial quantities, and this I regard as one of the great chemical triumphs of the year.

The process of manufacture is very simple; the same that nature employs in every thunder-shower; just changing the oxygen of the air to ozone by properly directed currents of electricity. A plant for this purpose has been erected in London, two others are being erected on the continent: as yet I have heard of none in America, but soon, I am persuaded our Yankee chemists will catch on, and have it on the market, before the sultry days of another summer. How convenient a bottle of it to carry in our pockets, to snuff, just as we used to the old "smelling-bottle"! With a bottle of ozone, a phial of liquefied oxygen, and a stick or two of solidified air, we could manage to be comfortable almost anywhere. The thought is so exhilerating, that I almost forgot to say that *ozone* is

A GOOD WEATHER PROPHET.

And if you wish to test its prophetic powers, all you have to do is to get a few slips of ozonometric paper, or make some yourself by dipping a sheet of paper (without sizing) in a solution of starch and a solution saturated with iodide of potassium. The ozone decomposes the iodide and liberates the iodine, which blues the starch. When you see your paper turning blue you may know that a storm is coming. This recipe I give on the authority of Henrie De Parville.

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*This, we understand, has been accomplished.

Here is something pretty, if not important: Helmholtz, the electrician, has discovered the human eye to be self-luminous, and has declared that he has been able to see the movement of his arm in total darkness, lighted only by the gleam of his optics. "Bright eyes," therefore, is no longer a lovers' hyperbole; the phrase is now a scientific truth.

PHOTOGRAPHING IN COLORS.

Color photography has attracted much attention during the past year, and the experiments in this line have been startlingly successful. Professors Lippmann and Vogel are the pioneers in this branch of the photographic art, and both are enthusiastic over recent results. Lippmann's investigations have proven that on a layer of albumen he could take brilliant photographs of the spectra, nor was it necessary to bring out the colors one at a time by a laborious application of specially prepared chemicals. On the contrary, they all came out at once, even red, and that, too, without the interposition of colored screens. In a letter to a society of photographers Lippmann says: "Announce the most wonderful discovery of the age. I have brought out colors more brilliant than the tints of the rainbow after an exposure of less than 30 seconds. Alas! I grieve to tell you that there are certain colors in the rainbow that I have not succeeded in chaining to my plate."

We hope, however, that such success will attend the labors of this indefatigable experimenter that the expectation, indulged in our last, will be realized, that before the century closes we shall have colored photographs; shall be able to rise from a sitting, leaving not a mere shade,—but a portrait on the plate.

A NEW EXPLOSIVE.

Pictet, the eminent French chemist claims to have invented an explosive as powerful as dynamite, and yet absolutely safe, as it can not be exploded, even by concussion, till it has been raised to a temperture of 800 degs. C. The machinery required to manufacture it is very costly, which fact is a safeguard against clandestine production.—*The Engineer, London, Dec. 22.*

In passing from this rapid and very imperfect review of the chemical discoveries of the year, allow me to tell you that chemists are sometimes detected in very ludicrous economies.

That they have been known to turn "scrap-iron into ink, old bones into lucifer matches, the shavings of the blacksmith shop into Prussian blue, fusil oil into oil of apples and pears, the drainings of cow-houses into fashionable perfumery, beggars' rags into new pilot-coats, cess-pool filth into ammonia, and tar-waste into aniline dyes and sugar." Who would have believed the noble science capable of such degradation !

ELECTRICAL SCIENCE.

The most remarkable invention of the year has been the *Telautograph*, by Professor Elisha Gray. By this instrument a man in New York may send his hand-writing by telegraph, to a man in Boston, and should the Bostonian be absent from his office the evening the letter was written, he may find it in his desk the next morning. While the New-Yorker is writing the letter a mysterious pencil is writing the same in Boston, in exact facsimile. This, I think, deserves to be classed with the telegraph, telephone and phonograph among the great electrical inventions of the Nineteeth Century.

The next greatest is telephoning without wire, but this, if we may credit the *Engineering and Mining Journal, Feb. 11th*, has been accomplished.

Professor Preece has sent a telephonic message from the shores of the Bristol Channel to the well-known island of Flatholm, three miles away from Cardiff, without the intervention of a connecting wire. And if three miles, why not 30 or 300?

A LOUD TELEPHONE.

A great drawback to the pleasure of conversing by telephone is the faintness of the responses—the Punch and Judy-like littleness of the speaking; but Mr. Graham of England assures us that he has overcome this difficulty, and made his telephones talk loud and naturally. If he has we hope he will set them up in America.

ELECTRICTY IN THE MANUFACTURE OF CHEMICALS.

We see that electricity is being used for the manufacture of chemicals, especially caustic soda and chlorine from sea-water; and, if as it is claimed, a saving of 50 per cent. is effected, then we say, let on the current. Hitherto the ocean has contributed nothing but its fish, and a little table-salt to the world's wealth; but it holds other and valuable salts in solution, and if electricity will make it relax its hold, and bring them out, then electricity will enrich the world.

It has long been a desideratum with electricians to produce

LIGHT WITHOUT HEAT.

This, according to the *Baltimore Sun*, has been nearly, if not entirely accomplished. It says in a recent issue:

"Recently an extraordinary genius appeared in this country who seems upon the verge of discovering, if not to have actually discovered, a method by which this might be done. Nikola Tesla, a man of independent fortune and most brilliant mind, who was for a time connected with Edison, has dared to experiment with rapidly alternating electric currents. The result has surprised the wildest dreams of theorizers. He has succeeded in producing light of comparatively high intensity without the production of heat and apparently directly by the use of electricy. The halls of the Royal Society of London and of the Franklin Institute of Philadelphia have been illuminated by means of the light radiated from bare copper wires in the open air carrying these so called Tesla currents.

The wires were not hot, but they radiated from their surface light and sent from one to another bands and streamers of the mysterious light which we see in the aurora borealis. The effect must be seen to be thoroughly appreciated, but when it is stated that the experimenter without difficulty succeeded in radiating light not only from an exhausted glass tube held in his hand, but also from his thumb, his nose and other features, the enthusiasm which swept over his audiences in London and in Philadelphia may be appreciated.

As yet no useful application has been found for these wonderful new develapments in electrical science, but they should be welcomed as a harbinger of further progress."

Here is something from the *London Telegraph*, which, I fear, will not be considered as very flattering to American inventors. But if true it should be recorded that the truth may stand—if false, that the falsehood may be exposed.

A TELEGRAPH LINE BEFORE MORSE'S.

Honor to the pioneers in the vast field of science! Mr. John Sime has published at the Chiswick Press in pamphlet form a very interesting memoir of Sir Francis Ronalds, who, twenty years before Wheatstone and Cooke or Morse had patented their improvements in the telegraph, indeed, while the first two were respectively lads of 12 and 14 years of age, had sent messages over eight miles of overhead wires of his own construction, and had laid and worked a serviceable underground line of telegraph of sufficient length to demonstrate the practicability of communication by telegraph between long distances.

Details of his overhead telegraph wires were published by him in 1823. Ronald's residence at Hammersmith, where these experiments were carried out, is the house now and for long time occupied by Mr. William Morris, the poet, who has caused a tablet to be placed on the wall bearing the inscription, "The first electric telegraph, eight miles long, was constructed here in 1816 by Sir Francis Ronalds, F. R. S." etc. An autotype facsimile of a portrait of this father of electric communication accompanies the publication.—*London Telegraph.*

THE STORAGE BATTERY.

A writer in the *New York World* is very hopeful. He says: "The storage-battery motor, which is to solve so many of the problems of electricity, appears, from the progress made in that science during 1893, to be a certainty within the near future. Hitherto the storage battery has been not only expensive but almost a failure. The great difficulties in the way of building an economical storage battery have, it appears, been now overcome. It is claimed that with the new battery a car can be run at a third less cost than under the trolley system, and that the economy thus gained has been so far demonstrated that electricians now concede the great end desired to have been accomplished."

ELECTRIC WELDING.

If we may believe the papers the electrical welding of rails on street railroads has been a complete success, giving a smooth continuous rail for two miles. But if a continuous welded rail will maintain itself against expansion for two miles, why not for a greater distance? And if continuity is the only thing desired, why may it not be secured by laying the rails close to each other, firmly held in their fish-plates? And what becomes of the old idea of all railroad men that room must be left for expansion between each two rails? And how will it be with the continuous welded rail when parts of it are worn or broken?

The welding of iron plates seems to be a use to which this new discovery may be put. Another possible application of the discovery is the tempering of one edge or one extremity only of steel-cutting tools. It has also been suggested for the hardening of the surface of armor plates for ships and for tempering the superficial surface of large guns.

GEOGRAPHY.

As we remarked in our last, Geographical work must be pushed mainly by explorations. Men must no longer be satisfied with old school-maps; they must go and see for themselves. This is just what R. G. McConnell, of the Dominion Geological Survey, has done on our own continent, and Mr. Oswald Baumann on the African, the first discovering the real source of the Mackenzie, the second the real source of the Nile.

SOURCE OF THE MACKENZIE.

On our school-maps the Mackenzie River rises in Great Slave Lake, but Mr. McConnell shows that this is a mistake. He has just returned from a four months' exploration trip in these regions, and found that it had its rise in a lake which the Indians call Lake Fehutade, which means in the Indian language "narrow waters between mountains." The lake is bebetween twenty-five and thirty miles long, and not more than a quarter of a mile wide, and well named Fehutade, for it is enclosed by high mountains.

SOURCE OF THE NILE.

From the *Globus*, a German periodical, published at Brunswick, I copy this: "Recent reports from Oscar Baumann's expedition to describe the country from the north end of Lake Tanganyika to Lake Victoria. On Sept. 5, Baumann struck the Kagera river, and was enthusiastically received by the natives of Urundi, who supposed he had just arrived from the moon, and regarded him as a decendant of their late ruler, who also claimed descent from that satellite. On September 11 Baumann crossed the Akenyaru, indicated on our maps as a hypothetical lake, but which in fact is only a river. The so called Mworengo Lake proved to be a river also, flowing through Akenyaru. There is, then, no great lake between the north end of Tanganyika and the southwest of the Victoria Nyanza. On September 19 Baumann reached the source of the Kagera, at the foot of a steep, forest-clad mountain, which forms the water-shed toward the basin of the Rufisi. This mountain, which the natives especially venerate is called by them the Mountain of the Moon. Here then, in remarkable conformity with the teachings of the ancients is the true source of the Nile, in German east-African territory. As such the Kagera must certainly be regarded, being that it is the most considerable tributary of the Victoria Nyanza." Till further notice then Fehutade Lake must be regarded as the source of the Mackenzie, and Kagera River as the source of the Nile.

THE CHANLER EXPEDITION.

In our last annual report we called attention to the expedition which William Astor Chanler was leading on the north-east coast of Africa, and said he was last heard from at Hamey-e, on the River Tana, the 28th of November, 1892. December, 1893, the expedition was heard from again by the Royal Geographical Society in London. It was reported that it was brought to a stop at Dhaico, a few miles north of the equator, near the north-east side of Mt. Kenia. It was said that 15 camels and 150 donkeys had been lost by the plague. The expedition was waiting for other parties and donkeys with goods to arrive from the coast. The messengers had been gone four months, and there was doubt whether the necessary supplies would reach the expedition.

RECLAMATION OF THE ZUYDER ZEE.

It may be of interest to our geographical friends to know that the Dutch government is now thinking of reclaiming the Zuyder Zee, leaving in the center the fresh water lake Yssel, from which navigable canals will radiate to the important towns. It is a stupendous project, and will cost, probably $100,000,000, a part of which will come back in the land reclaimed. Navigation will not be interfered with in the least; canals between the lake and the sea guarding against that. Half a million acres of fertile land will be reclaimed by this enterprise, and thirty-two years are allowed for its completion. We wish our Dutch friends all success in this great undertaking.

HIGHEST MOUNTAIN IN NORTH AMERICA.

We think the honor of being the highest mountain in North America has been accorded to Mt. St. Elias in Alaska, which, according to Mr. Mendenhall's measurement in 1892, is 18,014 feet. But on the calculations of C. A. Schott, based on the observations of J. T. Scovell, of Terre Haute, Orizaba, which has always had the second place assigned to it, is 301 feet higher, being 18,315 feet; so Orizaba must take the palm.

MOUNTAINS OF ALUM.

There are four unique mountains in Lower California, two of alum, one of alum and sulphur mixed, and one of pure sulphur. It is estimated that in the four peaks named there are 100,000,000 tons of pure alum and 1,000,000 tons of sulphur.

THE NAME OF THE NEW WORLD.

Philologists, we see, have again been at work on the names of countries, and we think Jules Marcou is right as to the origin of the name of our own. He derives it from Amerique or Amarrique, a name familiar in Central America, being the designation of a tribe of Indians in Nicaragua, of a locality in Veragua, of the sierra of those regions, the Sierra Amerique, and lastly of a stream, Quebrada Amerique, rich in gold. The Spaniards were familiar with this region and people, and the name, familiar to the Spanish sailors, spread among the common people, and became the designation of the whole continent. This, we think, more sensible than to derive it from Amerigo Vespucci, and it is certainly more American.

MASHONALAND AND ETHIOPIA.

Mr. Theodore J. Bent who, last year gave us an interesting volume on the ruins of Mashonaland, which has interested many in those colossal remains of a lost civilization, has now added a volume on Ethiopia, where he and his wife spent four months among ruins hardly less wonderful than those in Mashonaland, which afford a field for antiquarian research almost as fruitful as Egypt.

And then, as Ethiopia is the oldest of the Christian nations, the church there should be able to show some precious Christian antiques; they may not have the original Ark of the Covenant, which they say the son of Solomon brought from Jerusalem, but they doubtless have early Christian manuscripts, which would be of interest and service to the Christian world.

PEARY'S EXPEDITION.

Lieut. Peary, we know, is in the Arctic, and one of our Meriden boys with him. He is now shut in by the Arctic night in latitude about 77 degs., waiting for the darkness to lighten, to enter upon his long dog-sled journey. Our best wishes go with him, and the hope expressed in our last that he may plant the flag on the Pole itself.

NANSEN'S ARCTIC VOYAGE

was outlined some time ago in the ***Bulletin*** of the American Society. "Dr. Nansen proposes to enter the Arctic Ocean on his five year's voyage, or drift, in the early summer of 1893, through the Kara Sea, and to attain the highest possible point in the open water to the west of the New Liberia Islands. Beyond that point he will trust himself to the ice, and the current which runs, as he believes, across the Pole. His vessel, the Fram (Forward), has been built on his own plans. It is 101 feet in length and 33 feet in width, pointed at both ends, with rounded sides, and a comparatively flat bottom. The sides are from 28 to 32 inches in thickness, so as to give great strength to resist the pressure of the ice, though it is Nansen's belief that, as this closes in, the ship will be lifted up on the ice, and in that way escape crushing." In this I believe Dr. Nansen is right. I have always thought since I heard Dr. Hayes, in the Town Hall that, a ship, caught in the Arctic ice, could only be saved by being lifted ***upon*** the ice; no timber construction could withstand the pressure of two icefloes if fairly caught between them. And as for the open water which he expects to find—I should not be surprised if he found it, for a vessel, recently returned to San Francisco, from carrying supplies to the whalers in the Arctic Ocean, north of Alaska, reports that one whaler found open water at the mouth of Mackenzie River, and had followed it in a northerly direction until he reached a point a little above 84 degs., some farther north than the Greely expedition penetrated.

BJORLING AND KALSTONNIUS.

And here we should pause and drop a tear for Bjorling and Kalstonnius, two brave, scientific gentlemen from Sweden, who, with three companions, were undoubtedly lost while attempting to make a scientific exploration of the fauna and flora of Greenland, on the shores of Davis Strait. They reached the west coast of Greenland in safety, and the party was heard of last at the Danish settlement on that coast in the summer of '92. Since then all trace of the party has been lost, but the schooner in which they sailed has been found, fast in the ice, no boats or provisions aboard, evidently abandoned. In a cairn near by was found the dead body of a man, supposed to be one of the explorers; in another, manuscripts written in English, with instructions that they should be forwarded to the nearest Swedish Consul. It is supposed that the party attempted to reach the nearest mainland, 200 miles distant, and perished in the attempt. We should certainly add the names of Bjorling and Kalstonnius to the brave explorers of the year.

TO THE ANTARCTIC.

You have probably observed in the papers that an expedition is now fitting out for the Antarctic. It will be but a small affair, one little ship, and half-a-dozen brave men, but it may make discoveries of great value.

EARTHQUAKES.

It will be remembered that just at the close of '92, and again at the commencement of '93, the beautiful island of Zante in the Mediterranean, was nearly destroyed by earthquakes. February 13th, Samothrace was afflicted with a similar visitation. The earth was then comparatively quiet till the 18th of November, when, at Kushan, a city in the northern part of Khorassan in Persia, it began to shake with great violence, and 12,000 of its inhabitants were destroyed. Since then no earthquakes of great violence have been reported, though we have felt some slight jars even here, in New England. It has not however been an earthquake year.

EARTHQUAKES FAVORABLE TO VEGETATION.

Earthquakes we usually regard as unmitigated evils, catastrophes without compensation ; so we are glad to see that any one can find a benefit in them. This M. Goivan does, especially in those that have occurred in Northern Italy. He says that there he observed that they were followed by an earlier vegetation, and a more distinct greenness of foliage. He ascribes these results not to the earthquakes directly, but to the augmented production of carbonic acid, a more complete distribution of fertilizing matter in the soil, which suffered a sort of trituration from them, and to an increased electrical development. We think however that the average farmer would hardly care to have his lands cultivated by earthquakes.

VOLCANOES.

The last year has not been remarkable for its volcanic eruptions. In June a volcano burst forth in Colorado a few miles north of Thompson's Spring, on the Rio Grande Western railway, without doing much damage to surrounding property. Vesuvius has shown some signs of activity, Popocatapetl is in violent eruptions, and apprehensions are felt for a company of tourists who are now near its fiery crater.

Nor should geography scorn to notice the Ship Canals which have been brought to completion the last year, for one of them makes an island of one of its peninsulas, and the other a seaport of one of its inland cities.

THE CORINTHIAN CANAL.

The first is the Ship canal across the Isthmus of Corinth, for want of which ships, in going from one side of the isthmus to the other have had to sail 400 miles to make four since the birth of navigation.

"But why was this not thought of before?" It was. The scheme was first suggested by Periander of Corinth, 600 years before the Christian era. Alexander the Great and Julius Cæsar, each in his day, contemplated the expediency of carrying out the design. Nothing however was seriously attempted till the Emperor Nero revived the project; his engineers actually surveyed a route, but for some reason or other the design was permitted to languish, and only traces of their work can be found. In 1882 a French company was organized, and in April of that year the first sod was turned, but after expending 50,000,000 francs, the company failed.

A Greek company was then formed, and at an outlay of nearly twice the amount of the first estimated cost the canal has at last been completed, almost exactly on the lines laid down by the engineers of Nero. It is a little less than four miles long, 25 feet deep, and 100 wide in its widest part, mostly through rock rising in its highest part 250 feet above the sea level. It will be of immense benefit to the commerce of the Levant, and, as one has justly remarked, "is one of the many triumphs of peace whereof our century has just cause to be proud."

THE MANCHESTER SHIP CANAL.

This great canal, connecting Manchester and Liverpool, begun in 1887, is at last completed, and was opened to the public Jan. 1, 1894. It is 35½ miles long, 172 feet wide at the top, from 120 to 170 at the the bottom, and has four locks to accommodate the fall from Manchester to the sea, which is 60½ feet. The cost of the canal is variously estimated from 60,000,000 to 75,000,000, but at the highest figures, does not equal the cost of a war of six months' duration. It will be of immense advantage to Manchester, and all the inland towns and cities of Lancashire. It will make a seaport of Manchester, and I think a strange spectacle will be presented, when a forest of masts and steamship funnels is seen among the tall chimneys of this great manufacturing city.

Other Ship Canals have been projected. The Panama, you know, was "ditched" long ago. Our own Nicaraguan "hangs fire" notwithstanding its proximity to lake and ocean; the Cape Cod is stranded in the sands of Barnstable county; no canal, as yet, connects the Great Lakes and the Mississippi—but one *will* as soon as Chicago says the word.

PHYSICAL SCIENCE.

Except the Telautograph, already mentioned, and the solidification of atmospheric air, I know of no really new invention to credit to 1893. The air-ship doesn't sail, and the flying machine doesn't fly.

BIRD-FLIGHT.

There is something in the flight of birds even that men don't yet understand. Solomon said 3,000 years ago, there were four things he did not understand, and this was one of them.

How does the eagle, or any bird poise itself in the air? How does it rest, for several seconds, at high elevations, where the atmosphere is much lighter than it is here, apparently defying the laws of gravitation? It has considerable weight, 20 or 30 pounds, and if dropped dead even from a small elevation, it would fall with a thud. And yet it lies above us, on apparently motionless wings, as though it were no heavier than the atmosphere in which it floats. I don't wonder Solomon was mystified. "The flight of an eagle in the air" is a mystery which even Professor Longley's "internal wind-work," I fear will fail to solve; and until it is solved, we fear, man will attempt in vain to fly. But balloons, the last year, have attained the unprecedented height of ten miles; at least the one sent up by Messrs. Hermite and Bensancon, at Paris-Vaurigard, attained this elevation, as indicated by its self-registering barometer. The self-registering thermometer it carried, at an elevation of 7¾ miles, indicated a temperature of 60 degs. below zero, Fahrenheit, while, strange to tell, at the greatest elevation, 10 miles, it showed but 6 degs. below. The atmospheric pressure at this elevation was about one eighth as great as at the surface of the earth.

Captive balloons, we see, are suggested for photographing terrestrial areas, which, it is thought, may be utilized in war, obviating the exposure incident to real balloons when used for reconnoitering an enemy's position.

COAL-DUST AS A MOTIVE POWER.

Accounts come from Germany that Herr Kupp is now constructing a number of experimental engines for the purpose of utilizing the explosions of coal-dust. He proposes to grind coal to an impalpable power, and after introducing the dust floating in the air into the cylinder of an engine, *explode* it. While modern practice converts only 10 or 15 per cent. of the heat-energy stored in coal, into power at the crank of a steamengine, it is believed that no less than 75 or 80 per cent., could be made available by the direct combustion of the fuel through explosions of coal-dust.

INVENTOR OF STEAMBOATS.

We are in the habit of ascribing the invention of steamboats to Robert Fulton, but Governor Fuller of Vermont read a paper before the Professional Club of Attleboro recently in which he clearly established the claim that Samuel Morey of Fairlee, Vt., was the first man who invented, built and ran a steamboat. His experimental crafts were run on the Connecticut River at Fairlee, also between Hartford and New Haven, and from Bordentown, N. J., to Philadelphia. Robert Fulton made practical application of Morey's idea to commercial use, but Morey was the real inventor.

ALUMINUM—BAUXITE.

In the manufacture of Aluminum we have the advantage of the world, for Alabama and Georgia contain inexhaustible mines of Bauxite, a kind of clay which yields 48 per cent. of pure aluminum in the light tints, and 40 per cent. in the brown shades, whereas ordinary clay yields on an average only 33 per cent.

The lightness of the new metal, and its power to resist the attacks of vegetable acids, commends it for cooking utensils; but it is objected to its use for this purpose that it is too soft, and quickly wears out; that it is not acid-proof, and is consequently poisonous. To the first objection I reply it can be hardened with chromium, and if unalloyed, if never scoured, but only washed in hot water, it will last as long as copper; and when worn out the vessels made of it have a commercial value, old aluminum selling as readily as old copper. To the second and more serious objection I answer, German physicians and chemists the last year have subjected the new metal to a most rigorous examination, and after experimenting for half a year, mostly upon themselves, pronounce it perfectly harmless. The new metal, I observe, is being utilized for slate pencils; and the writing with them is said to be as clear as with ordinary pencils, and the erasure as easy—which I doubt.

It has been heretofore almost impossible to make large castings of aluminum, but the difficulty has been so far overcome that pure aluminum bath-tubs are made, weighing 140 pounds.

ORNITHOLOGY.

Dinornis giganteus. In our last we called attention to bird-bones recently found in New Zealand, which showed that the bird to which they belonged was fourteen feet high—we might as well have said *sixteen*, for Professor Owen gave the height of the *Dinornis giganteus* as ranging between ten and sixteen feet. He first made an examination of one of these bones as early as 1839, and found that it was not strictly a fossil, and did not necessarily belong to an extinct species. The bone was not mineralized, and retained much of its animal matter, though it had evidently remained in the ground for some time.

Says a recent scientist, speaking of this find, "The law of the localization of animals, so remarkably illustrated in the recent progress of geology, receives an additional confirmation by this occurrence in the river-banks of New Zealand of remains of gigantic birds allied to the small species (the *apteryx*) still existing only in the same islands."

When great tracks of some extinct animal were first discovered in the red sand-stone of the Connecticut valley, geologists called them bird-tracks; but of late years have referred them to reptiles; even the last and best find, recently quarried at Portland, is promptly accredited to the *Anischnus Deweyanus.* But, as we remarked in our last, the geologic pendulum now seems to be swinging the other way, and we should suppose that the discovery of the *D. giganteus* in New Zealand would tend bird-ward. Certainly it removes the objection once urged against the bird-track theory, that no bird ever lived large enough to make such tracks, for here are tracks 22 inches in length and 6 inches in breadth, considerably larger than those of the Connecticut Valley.

In 1856 Professor Owen, from bones in his possession, determined another species of this remarkable bird, which he called *Dinornis elephantopus*, the most extraordinary of all for the massive strength of the limbs and the general proportions of the breadth and bulk to the height. It stood fourteen feet high, and had thigh-bones stouter than those of a horse.

AN IMMENSE EGG.

The *Aepyornis* is another immense bird of Madigascar, now extinct. I have not heard of any bones of this great bird having been found the last year, but have heard of an immense egg worthy of mention.

This egg is 28 by 33½ inches in circumference—about 9 by 12 inches in diameter. In cubical contents it is six times as large as the ostrich's egg. It was found floating at sea, about 20 miles from land, and was probably washed out from the sand in which it was laid, and preserved, we don't know how many hundred years.

OMISSIONS.

It should have been noted under *Bacteriology* that Pasteur is still practicing with baccilli, with which, he claims, not only to have prevented rabies, but to have cured it after it was well developed. And, with reference to the *cholera bacillus*, that it thrives wonderfully on salt, and it is thought that the unusual saltness of the water of the River Elbe last year may have had something to do with the cholera-epidemic at Hamburg. And it may be noted here that Wernicke and Behring, two German chemists, have found that the poisons of both the diphtheria and tetanus microbes can be neutralized by iodine trichloride. It takes however an intense cold to kill them.

Pictet finds that, subjected to the intense cold produced by the liquefication of atmospheric air, infusoria die at 90 degs. centigrade, while bacteria are still virulent at 213 degs.

TOBACCO AND CHOLERA.

Experiments made in the hygenic institute in the Berlin University show that cholera bacilli die more quickly on dry tobacco than on dry glass plates; that they do not multiply, but quickly die, on moist tobacco; and that tobacco smoke quickly kills them.

NECROLOGY.

Among the deceased of the year we have to report one most eminent in the domains of science, Prof. John Tyndall, who died Dec. 4, 1893, in the 74th year of his age; and a sad fact in connection with his death was that it was occasioned by poison, accidentally administered by his wife.

Prof. Tyndall occupied the foremost place among his contemporaries as an exponent of scientific discoveries, his only rival being his close friend, Prof. Huxley. The influence of his work in the modification of thought of the present generation cannot be overestimated. His chief personal characteristics, aside from his scientific researches, were an unaffected simplicity and amiability.

Our appreciation of this great scientist is well expressed in the memorial presented by Mr. Geo. L. Cooper and Rev. Geo. K. MacNaught immediately subsequent to his death.

The committee appointed at the last meeting of the Meriden Scientific Association to prepare a memorial to the late Prof. John Tyndall recommend that the following be spread upon the minutes of the Association:

JOHN TYNDALL,

Born Aug. 21, 1820, Died Dec. 4, 1893.

It is with deep regret that we note on our minutes the death of so illustrious a physicist, a man whose private as well as public life may well be an example; one whose researches in science, remarkable alike for patience and skill, left him "no time to make money;" one whose investigations were as critical and thorough as his spoken and written expositions of them were luminous and valuable.

The lives of few men have been simpler or more useful to mankind.

GEORGE L. COOPER,
GEORGE K. MACNAUGHT.

Other scientists, less eminent, have gone with the year.

Prof. Herman August Hagen, of Harvard University, eminent as a Surgeon and Entomologist.

Dr. John Rae, Scientist and Explorer.

Dr. Henri Francois Duchinski, the Polish Patriot and Scientist, author and lecturer. His widow, now in her 67th year, is one of the most eminent Polish writers.

Sir. Samuel Baker, the distinguished African explorer, known and feared all through Central Africa as the "White Pasha," died at his residence at Newton-Abbot, Devonshire, England, Dec. 30, 1893. He was born in London, June 8, 1821;

And *Dr. Arthur Milnes Marshall,* F. R. S., Professor of Zoology at Owen's College, Manchester, who was killed by falling over a precipice while attempting the ascent of one of the peaks of Scafell, a mountain in Cumberland, on the last day of the year.

I am glad to announce that justice has at length been done to James G. Percival, the great Geologist of Connecticut, and to add a brief description of the Monument erected to his memory at Hazel Green, Wisconsin.

It is of granite, quarried at Niantic, this state, the idea being to place over the grave of Connecticut's first geologist a block of his native stone. The inscription reads as follows:

"*James Gates Percival,* born in Berlin, Connecticut, September 15, 1795; graduated at Yale College, B. A. 1815. M. D. 1820, State Geologist of Connecticut 1835-1842, State Geologist of Wisconsin 1854-1856. Died in Hazel Green, May 2, 1856. Eminent as a poet, rarely distinguished as linguist, learned and acute in science; a man without guile."

And to these may I add the name of *Hon. I. C. Lewis,* not as a scientist, but as a philanthropist, to whom directly, and through Dr. Chapin, the Association is indebted for many favors. And now that he is gone, I may say what I was not at liberty to say while he lived, it was his liberality that enabled the Association to publish my last annual address.

NOTE.—The author of this address hopes that none of his readers will be uncharitable enough to suppose that he inflicted the whole of it upon his audience at a single sitting; such was not the case, but only so much of it as could be read in an hour. The rest he publishes as containing matter which may be of some slight use to himself or others. J. T. P.

TRANSACTIONS OF THE MERIDEN SCIENTIFIC ASSOCIATION.

VOL. I.

Catalogue of the Phænogamous and Vascular Cryptogamous Plants found growing in Meriden, Conn., from 1881 to 1883.
Emily J. Leonard.

VOL. II.

The Catopterus Gracilis. Chas. H. S. Davis, M. D.
The Hanging Hills. J. H. Chapin, Ph. D.
An Interesting Find. J. H. Chapin, Ph. D.
A List of the Birds of Meriden. Franklin Platt.
Additional Plants found growing in Meriden. Mrs. E. B. Kendrick.
West Peak, and What it Saith. Rev. J. T. Pettee, A. M.

VOL. III.

The Ash Bed at Meriden and Its Structural Relations.
Wm. Morris Davis.
The Nidus ef Lunatio Heros. F. J. Seidensticker.
The Trap Ridges of Meriden Again. J. H. Chapin, Ph. D.
Some Notes of Africa. J. H. Chapin, Ph. D.
The Horizontal Moon- Rev. J. T. Pettee, A. M.
A Supplementary List of the Birds of Meriden. Franklin Platt.
A List of Butterflies of Meriden. Franklin Platt.
A List of Forest Trees and Shrubs to be found in Meriden.
Chas. H. S. Davis, M. D.

VOL. IV.

James G. Percival, M. D., Portrait. Rev. J. T. Pettee, A. M.
Sewerage; Its Carriage and Disposition. Geo. L. Cooper.
The Topographical Survey of Connecticut. J. H. Chapin, Ph. D.
Some Geological Features of Meriden. J. H. Chapin, Ph. D.
Cycadinocarpus Chapinii. J. H. Chapin, Ph. D.
The Pre-Columbian Discovery of America by the Northmen.
Chas. H. S. Davis, M. D.

VOL. VII.

TRANSACTIONS

. . . OF THE . . .

MERIDEN SCIENTIFIC ASSOCIATION

MERIDEN, CONN.

1895

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PROCEEDINGS AND TRANSACTIONS

OF THE

SCIENTIFIC ASSOCIATION,

MERIDEN, CONN.

1894-95.

Vol. VII.

Published by the SCIENTIFIC ASSOCIATION,
MERIDEN, CONN.

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1895

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Gift of the Association
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The Oldest Fairy Tale,
Rev. Chas. E. Moldenke, Ph. D.

Officers.

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Simeon T. Frost. A. M.	Vice President
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Physics,	George L. Cooper
Technology.	
Psychology,	Miss Edith A. Rockwell
Publishing Committee,	Chas. H. S. Davis, M. D., Geo. L. Cooper, Robert Bowman.

Report of Curator and Librarian.

The following have been received by exchange of presentation since our last report:

Report of Johns Hopkins University, 1894-1895.

Report of Central Park Menagerie, 1894-1895.

Report of U. S. Chief of Ordnance, 1894-1895.

Report of Chief Signal Office, 1894-1895.

Report of U. S. Geological Survey, 1894-1895.

Report of Smithsonian Institution, 1894-1895.

Report of Royal Cornwall Polytechnic Society, Falmouth, 1894-1895.

Report of American Museum of Natural History, Central Park, 1894-1895.

Report of Zoological Society of Philadelphia, 1894-1895.

Report of Proceedings of Belfast Naturalist Field Club, 1894-1895.

Report of Curators of Museum, Wesleyan University 1894-1895.

Report of State Mineralogist of California, 1894-1895.

Bulletin of Torrey Botanical Club, 1894-1895.

Bulletin of Minnesota Academy of Natural Sciences, Vol. VI.

Bulletin of Scientific Association, Peoria, Ill., 1894-1895.

Bulletin of Essex Institute, 1894-1895.

Bulletin of American Geographical Society, 1894-1895.

Bulletin of Washburn Laboratory of Natural History, Topeka, 1894-1895.

Bulletin of American Museum of Natural History, New York, 1894-1895.

Transactions of Academy of Science, St. Louis, 1894-1895.

Transactions of the Wagner Free Institute of Science, Vol. V, 1894- 1895.

Transactions of Geological Society of Glasgow, 1894-1895

Transactions of Academy of Sciences of New York, 1894-1895.

Transactions of Royal Society of Cornwall, Penzance, 1894-1895.

Transactions of Academy of Sciences, Kansas, Vol. XIV.

Proceedings and Transactions of Natural History Society of Glasgow, 1894-1895.

Proceedings of Colorado Scientific Society, 1894-1895.

Proceedings of Natural Science Association of Staten Island, 1894-1895.

Proceedings of Canadian Institute, Toronto, 1894-1895.

Proceedings of Davenport Academy of Sciences, 1894-1895.

Proceedings of Natural History Society of Wisconsin, 1894-1895.

Proceedings of California Academy of Sciences, 1894-1895.

Proceedings and Transactions of Royal Dublin Society 1894-1895.

Proceedings of Folkestone Natural History Society, 1894-1895.

Proceedings and Transactions of Nova Scotia Institute of Natural Science, Vol. VI.

Proceedings of Belfast Natural History and Philosophical Society, 1894-1895.

Abstract of Proceedings of the Geological Society of London, 1894-1895.

Memoir and Proceedings of Manchester Literary and Philosophical Society, 1894-1895.

Journal of Elisha Mitchell Scientific Society, 1894-1895.

Journal of Liverpool Polytechnic Society, 1894-1895.

Journal of New York Microscopical Society, Vol. IX.

Journal of Royal Institute of Cornwall, Texas, 1894-1895.

Journal of Cincinnati Society of Natural History, 1894-1895.

The Academy of Sciences of St. Louis, 1894-1895.

Colorado College Studies, 1894-1895.

Johns Hopkins University Circulars, 1894-1895.

American Ephemeris and Nautical Almanac, 1895.

West American Scientist, 1894-1895.

Ornithologist and Oologist, 1894-1895.

The Nautilus, 1894-1895.

United States Geological Survey, 1894-1895.

FOREIGN EXCHANGES.

Memoire Della R. Accademia Dell Scienze Dell' Institute di Bologna, 1894.

Bulletino Mensile della Academia Gioenia di Scienze Naturali, Catania, 1894-1895.

Atti e Rendiconti della Academia Medico-Chirurgica di Perugia, 1894-1895.

Atti della Societa Toscana di Scienze Naturali, 1894-1895.

Alla Memoria del Prof. Giuseppe Meneghini. Pisa, 1894.

Programma del Regio Instituto Tecnico Superiore di Milano, 1894-1895.

Annali del R. Instituto Tecnico Antonio Zanon in Udine, 1894.

Sitzungsberichte der Naturforchenden Gesellschaft zu Leipzig, 1894-1895.

Verhandlungen der Naturhistorischen Vereines der Preussischen Rheinlande, etc., Bonn, 1894-1895.

Programm der Technischen Staatslehranstalten zu Chemnitz. Osteen, 1894.

Jahresbericht der Naturforchenden Gessellschaft in Emden, 1894-1895.

Fuhrer durch das Kgl. Mineralogisch-Geologische und Prachistorische Museum zu Dresden, 1894.

Abhandlungen Herausgegben vom Naturwissenschaftlichen Vereins zu Bremen, 1894-1895.

Monatliche Mittheilungen Gesammtgebiete Naturwissenschaften, Frankfort, 1894-1895.

Annalen des K. K. Naturhistorischen Hofmuseum. Wien, 1894-1895.

Jahresbericht der Geographischen Gessellschaft zu Griefs wald, 1894-1895.

Vierundzwanzigster Bericht der Oberhessischen Gesellschaft fur Natur-und Heilkunde. Giessen, 1894-1895.

Verhandlungen der Naturforschenden Gesellschaft in Basel, 1894-1895.

Jahresbericht der Vereins fur Naturwissenschaft zu Braunschweig, 1894-1895.

Korrespondenzblatt des Naturforscher-Vereins zu Riga, XXXIV, 1895.

Jahresbericht der Technischen Staatslehranstalten zu Chemnitz. Ostern, 1895.

Jahresbericht der Naturhistorischen Gesellschaft zu Hanover, 1894-1895.

Anzeiger der Kaiserlichen Akademie der Wissenchaften, XXVIII, Jahr, 1895.

Fetschrift zur Feier des Funfundzwanzigjahrigen Bestchens des Naturwissenschaftlichen Vereins zu Bremen, 1895.

Bericht Oberhessischen Gessellschaft fur Natur-und Heilkunde, Giefsen, 1805.

Verhandlungen des Botanischen Vereins der Provinz Brandenburg. Berlin, 1894-1895.

Register Uber die Verhandlungen des Botanischen Vereins der Provinz Brandenburg. Band 1, XXXII, 1894-1895.

Annales Societe Linnernnee de Lyon, 1894-1895.

Questionnaire de Sociologie et d'Ethnographie. Paris, 1894-1895.

Bulletin de la Societe Zoologique de France. Paris, 1894-1895.

Bulletin de la Societe. Vaudoise des Sciences Naturelles, Lausanne, 1894-1895.

Bulletin des Seances de la Societe Entomologique de France, 1894.

Bulletin de l'Institut National Genevois. Tome, XLI, 1894.

Memoires de I'Institut National Genevois 1894-1895. H. & L. Siret. Bruxelles, 1894.

Lois, Statuts et Reglements concernant les Anciennes Academies et l'Institut, de 1894 a 1895. Paris, 1895.

Societe Botanique de Lyon. Bulletin Trimestrial, 1895.

Congres International des Sciences Ethnographiques. Paris, 1895.

Societatum Litterae, 1895. Frankfort.

Acta Societatis Pro Fauna et Flora Fennica, 1894-1895. Helensingfors.

Meddelanden af Societatis Pro Fauna et Flora Fennica, 1894-1895. Helsingfors.

Notae Conspectus Florae Fennicae Auctore Hjalmar Hjelt. Helsingfors, 1895.

Herbarium Musei Fennici, 1, Plantae Vasculares. Helsingfors, 1895.

Archives Musee Teyler. 1894-1895. Harlem.

Fondation Teyler. Catalogue de la Bibliotheque, 1894-1895. Harlem.

Communicacoes da Commissao dos Trabalhos Geologicos de Portugal. Lisbon, 1894-1895.

La Naturaleza, Periodico Cientifico de la Sociedad Mexicana de Historia Natural. Mexico, 1895.

Liste Systematique des Publications de l'Institut Royal Geologique de Suede. Stockholm, 1895.

Bifhag till Kongi, Svenska Vetenskaps-Akademiens Handlingar. Stockholm, 1894-1895.

Entomologisk Tidskrift, 1894. Stockholm.

Praktiskt Geologiska Undersokningar inom Jemtlends Lan. Stockholm, 1894-1895.

Om Lias I Sydostra Skane. af Joh. Chr. Moberg. Stockholm, 1894.

Sveriges Geologiska Undersokning. Ser. C. Nos. 95-116.

Om Granitindustrien I Utlandet Sarskildt Storbritannien. H. Lundbohm. Stockholm, 1895.

Om Apatitens Forekomstaatt I Norbottens Lan. af G. Lofstrand. Stockholm, 1895.

Fourteenth Annual Meeting.

JANUARY 14, 1895.

The fourteenth annual meeting of the Meriden Scientific Association was held at the Assembly Room of the High School, January 14, 1895. The President, Rev. J. T. Pettee, A. M., gave his review of the year, confining himself, however, to its Archæological discoveries, and the light which they necessarily throw on Anthropology and Ethnology.

At the request of the President, Mr. George L. Cooper read the following abstract of the doings of the society for the last year. We have held eight meetings. At the first, January 14, 1895, we listened to the Annual Address, received the report of the Curator and Librarian, and elected officers for the ensuing year. Appropriate resolutions on the death of Tyndall, prepared and submitted by Mr. George L. Cooper and Rev. George K. MacNaught, were passed at this meeting.

Mr. Pettee congratulated the Association upon the fact that justice had at last been done to the memory of that eminent Connecticut geologist, Dr. James G. Percival, by the erection of a suitable monument at Hazel Green, Wisconsin, where he died, May 2, 1856.

February 12, 1894. No meeting on account of fierce snow storm then prevailing.

March 12, 1894. Dr. Wilson gave an able and interesting lecture on the Polariscope.

May 14, 1894. About forty attended the May meeting. Professor Frost read an able geological and geographical paper on "The Mission of the Mountains in Civilization," which was listened to with close attention and followed by hearty applause.

Dr. Wilson made some microscopic remarks, reading a very interesting account of recent microscopic discoveries showing scales on some butterflies' wings which emitted thirty distinct odors.

Mrs. Guy read an interesting account of the "*Baobab Tree*" of Africa, (Andozonia Digitater) which sometimes attains a diameter of thirty feet, and a height of fifty or sixty, some specimens of which are supposed by botanists to be 5,000 years old.

Mr. Pettee reported the sun free from spots, Saturn and Uranus in fine position for observation, the rediscovery of of Tempal's comet by Finlay at the Cape of Good Hope, and the interesting fact that Mr. Lewis of Ansonia, (the same gentleman, who, two years ago photographed a meteor, and sent us a copy of his photograph) had photographed the tail of a comet, though the telescope failed to detect one, and ventured the opinion that those comets which, when first discovered, are reported "tailless," *have* tails, though the telescope alone cannot detect them.

He also sent up, to be read by the Recording Secretary his review of Lockyer's "*Dawn of Astronomy*," published in the march number of the Biblia, apologising to the association for having published before presenting it.

June 11, 1894. Dr. Davis read an able and exhaustive paper on "Modern Spiritualism." Then came our summer vacation.

September 10, 1894. The Association resumed its meetings. The evening was rainy and the attendance light in consequence. A miscellaneous paper on astronomical matters was presented by the President. An excursion to the Peabody Institute was ordered for the 29th.

September 29, 1894. About forty went down and found the visit full of interest and instruction, even to those who had visited the Institute before.

October 8, 1894. The President presented an astronomical paper. He also spoke of the (then) approaching transit of Mercury, and gave notice that he would claim the floor for the next meeting, Nov. 12th, to present a paper on "*The Follies of Astrology*," provided the catastrophe predicted by astrologers for that evening held off till 8 o'clock.

Prof. Frost read a very interesting letter just received from Hugh Lee, our brave Meriden boy who is spending another winter with Lieut. Peary in the Arctic.

November 12, 1894. Small but appreciative audience. The President read a paper on the "Follies of Astrology," and the corresponding secretary, Dr. C. H. S. Davis, a most interesting letter from A. W. Terrell, U. S. Consul at Constantinople, descriptive of the antiquities recently unearthed at Niffer, near Babylon, by an American exploring party. The letter has since been published in the November Biblia, and is well worthy the perusal of all who failed to hear it.

December 10, 1894. The last meeting of the year, at which the attendance was so large that we were obliged to leave the library and take to the large upper schoolroom, Mr. Ernest L. Robinson gave us an able and interesting paper on "*Comets,*" and Prof. Frost a most instructive and interesting lecture on "*Corea, the Hermit Kingdom.*" It being the last meeting for '94, the president read his *death list* containing the names of eminent scientists, inventors, and explorers who had died during the year.

After listening to the address the Association went into executive session, and received the report of the Recording Secretary, Curator and Librarian, Mr. Robert Bowman, the report of the Treasurer, Dr. G. H. Wilson; and elected the officers for 1895.

The Tablet Inscription of the Jews of China.

By REV. A. KINGSLEY GLOVER, Appleton, Wis.

Honorary Member of the Meriden Scientific Association. Instructor
in Chinese in Lawrence University. Member of
the Victoria Institute.

In December, 1850, the London Missionary Society, with headquarters at Shang-hai, China, despatched two Christian Chinese to Kai-fung-fu, on the Hoang-ho river, to investigate the condition of the Jewish colony there and to learn as much about its history as was possible. Before the end of the above month they arrived in Kai-fung-fu and began their investigations, assisted and directed at first by some Mohammedans resident there. On being shown the spot where the Jewish temple had been erected, they found the sacred edifice nearly all in ruins, but, happily, *two tablets*, bearing respectively the dates 1511 and 1488, were found intact, and the Chinese inscriptions on them were transcribed by the two Chinese agents of the London Society and taken to Shang-hai where they were translated by Dr. Medhurst, a very great Sinologue.

The tablets were of marble, and were discovered beneath the ruins of a small enclosure where they could not be reached, the inscriptions being visible only through a *hole in the ruined wall*, through which a candle was thrust to lighten the interior while the transcribers were at work.

These tablet inscriptions are among the most interesting archæological records yet discovered among the Jews of the *extreme eastern diaspora*, and I present them here in their entirety with my own commentary, and with critical remarks and comments by Dr. De Lacouperie. Regarding the entrance of the Jews into China, I have always claimed the middle of the 5th (fifth) century A. D. as the time of this arrival. Thus far I have no reason to change my opinion.

There are still about two hundred Jews living at Kai-fung-fu. They were visited last by the agent of the Scotch Bible Society in 1893. He found the site of the temple marked by a *stone* on which were recorded the dates of the building and ruin of the structure, and of its occasional *rebuilding.* The Jews live near the site of their old *house of God*, but of the JEWISH RELIGION they are absolutely ignorant. They still exhibit the Jewish physiognomy to a considerable degree, although there must have been some intermarriages to all appearance. They are known to the Chinese (*Mohammedans and others*) as the "*Sect that plucks out the sinew*," which shows that the Chinese Jews adhered closely to the old Jewish law prohibiting the consumption of the *blood* of food animals—a law involving the EXTRACTION OF THE VEINS, but which the Chinese thought were the "*sinews*,"—whence the above name by which the Chinese Jews are known to this day.

Besides the *tablets*, a number of brief Hebrew inscriptions were transcribed, while a quantity of Hebrew books, mostly parts of the Old Testament, were purchased and taken to Shang-hai. Several large rolls of the *Torah* were recovered and placed in the British Museum, Bible House, N. Y. and other safe repositories.

Tablet of 1488.[1]

A Tablet Recording the Rebuilding of the Temple[2] of Truth and Purity.

A-WOO-LO-HAN,[3] the patriarch who founded *Yih-sze-lo-nee-keaou*[4] was the nineteenth descendant from *Pwan-Koo*, or *Atan.*[5] From the beginning of the world the patriarchs have handed down the precept, that we must not make images and similitudes, and that we must not worship *Shin-Kwei*,[6] for neither can images and similitudes protect, nor *Shin-Kwei* afford us aid.

The patriarch,[7] thinking upon Heaven,[8] the pure and ethereal Being who dwells on high, the most honorable and without compare,—that Divine Providence who, without speaking, causes the four seasons to revolve and the myriad of things to grow;[9] and looking at the budding spring, the growth of summer, the in-gathering of harvest, and the storing of winter,—at the objects that fly, dive, move and vegetate, whether they flourish or decay, bloom or droop, all so easy and natural in their productions and transformations, in their assumptions of form and color, [1]—was suddenly aroused to reflection, and understood this deep mystery.[2] He then sincerely sought after the correct instruction and adoringly praised the true Heaven, with his whole heart he served, and with undivided attention reverenced Him. By this means he set up the foundation of religion and caused it to be handed down to the present day.

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[1] In the commentary on this tablet, when words and phrases that appear in the preceding tablet are repeated, I frequently refrain purposely from commenting a second time.
This tablet deals mainly with Jewish history and the externals of religion.

[2] i. e. the Jewish temple at Kai-fung-foo.

[3] Abraham.

[4] i. e. Israel religion.

[5] There is a positive identification, on the part of the Jews, of Adam with the Chinese mythological personages, the giant Pwan-koo, the first being on earth in the Chinese mythology. We see here again how eager the Jews were to blend their religion and customs with those of the Chinese, though they kept clear of idolatrous customs to a wonderful extent.

[6] Shin-Kwei. I prefer to render the two Chinese characters as gods and spirits, and thus would make the Chinese read Shin and Kwei.

[7] Abraham.

[8] From what follows Heaven must here mean our *God*.

[9] There is here a conception of Deity or Jehovah in no wise antagonistic with the Old Testament.

This[3] happened, according to our inquiry,[4] in the 146th year of the *Chow* state.[5] From him the doctrines were handed down to the great teacher and legislator *May-She*,[6] who, according to our computation, lived about the 613th year of the same state.[7]

This man (Moses) was intelligent from his birth, pure and disinterested, endowed with benevolence and righteousness, virtue and wisdom, all complete.

He sought and obtained the sacred Writings on the top of *Seih-na's* hill,[8] where he fasted forty days and nights,[9] repressing his carnal desires, refraining even from sleep, and spending his time

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1) All these aspects of Nature were very prominent in the region of Kae-fung-foo, where the Jews had settled. This valley of the Hoang-ho was, and still is, the most fertile part of China, and teems with many forms of animal life.

2) i. e. Abraham. We most certainly discern here the belief of the Jews, that Abraham was inspired by Heaven with the beginnings of the revelations of divine truth, though the whole paragraph presupposes the previous possession, on the part of Abraham, of a naturally deep religious nature, that caused him to "think upon Heaven." He, however, "understood this deep mystery" by a sudden inspiration.

3) i. e. this revelation and establishment of the true religion.

4) Those who erected this tablet were evidently careful in their statements and made searching "inquiry" before inscribing these things on marble.

5) The Chow claimed for their first ancestor Hou tsih, the husbandry officer of Shun, whose reign began in 2254 B. C. His descendants retired amongst the barbarian tribes of the west until 1817 (or 1796) B. C., when they reappeared under the leadership of Kung-lew, and settled at Pin, in Shensi, on the borders of the Chinese lands. "It was from this time that the principles of the Chow dynasty began to flourish." (Cf. W. H. Medhurst, The Shoo King, pp. 335, 347, 357; and J. Legge, Chinese Classics, IV. 2). Now the text refers not to a Chow Kwoh or Chow state but to the Chow Chao or Chow court, reign or dynasty, and therefore could not apply to anything before the event of 1817 B. C. These dates are those of the common chronology in vogue since the Sung dynasty, eleventh century, and therefore may have been used by the Chinese Jews of the fifteenth century.—T. de L.

6) Moses.

7) The Chow State began its independent existence about 2254 B. C. The 613th year from that would have been 1641 B. C. This tablet then places Moses about 1641 B. C.

8) i. e. Mount Sinai.

9) Ex. xxiv : 18. (But no mention is made here of Moses "fasting!")

重建清眞寺碑記

夫一賜樂業、立教祖師、阿無羅漢、迺盤古阿躭十九代孫也、自開闢天地祖師相傳、不塑于形像、不諂于神鬼、形像無佑、神鬼無濟、思其天者輕清在上、至尊無對、天道不言、四時行而萬物生、觀其春生、夏長、秋斂冬藏、飛潛動植、榮悴開落、生者自生、化者自化、形者自形、色者自色、祖師醒然悟此幽玄、實求正教、參贊眞天、一心侍奉、精專敬謹、那其間立教本、至今傳、考之在周朝一百四十六年也、一傳而至正教祖師乜攝、考之在周朝六百十三載也、生知純粹、仁義俱備、道德兼全、求經於昔那山頂、入齋四十晝夜、去其嗜欲、亡絕寢膳、誠意祈求、虔心動感天心、正經一部五十三卷、有自來矣、其中至微至妙、善者感發人之善心、惡者懲創人之逸志、再傳而至正教祖師蒿子喇、系出祖師、道承祖統、敬天禮拜之道、足以闡祖道

Tablet Inscription, bearing date, 1488, found near the remains of a Jewish Temple at Kai-fung-foo.

PLATE I,

in sincere devotion.[1] His piety moved the heart of Heaven,[2] and the *Sacred Writings*, amounting to fifty-three sections,[3] were thus obtained. Their contents are deep and mysterious,[4] their promises calculated to influence men's good feelings,[5] and their threatenings to repress their corrupt imaginations.

The doctrines were again handed down to the time of the reformer of religion and wise instruction, *Ye-tsze-la*,[6] whose descent was reckoned from the *founder* of our religion,[7] and whose teaching contained the right clue to his instructions, *i. e.* the duty of honoring heaven by appropriate worship, so that he could be considered capable of unfolding the mysteries of the religion of our forefathers.[8]

But religion must consist in the purity and truth of divine worship.[9] *Purity* refers to the Pure one, who is without mixture[10] and *truth* to the *Correct One*, who is without corruption.[11] Worship consists in reverence, and in bowing down to the ground.[12]

Men, in their daily avocations, must not for a single moment forget Heaven, but at the hours of *four* in the morning, mid-day, and six in the evening, should thrice perform their adorations,[13] which is the true principle of the religion of Heaven.

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1) This is more of a miniature paraphrase of the Biblical account of Moses in the Mount, than an exact reproduction, since these details of the forty days on the mount are wanting in the Biblical account.

2) We have here a mere anthropomorphic phrase—a mere rhetorical figure, in "heart of Heaven."

3) This (as stated in tablet 1511) was, and is the Persian division, the Western Jews dividing the Law into 54 sections.

4) "My thoughts are not your thoughts." (Is. lv: 8).

5) In the Chinese-Jewish moral code, men in general have a degree of natural goodness ascribed to them.

6) Ezra.

7) This, of course, is not a fact. There was a tendency among the Jews to trace back every prominent man or woman to a revered patriarchal family, and these Chinese Jews are not free from this.

8) "Whose teaching contained the right clue to his instructions" is a peculiar phrase, and probably would convey the idea that Ezra's method and style of teaching were conducive to a clear understanding of his instructions about "honoring Heaven" etc.

9) There is here drawn a very distinct line between "religion" and morals. "Religion" is "divine Worship" in its "purity and truth."

10) i. e. God is the only object to be thought of as really pure, and in speaking of purity, we ought to think at once of this divine purity.

11) As with "purity," so with "truth." We ought not to think of truth without thinking of Him who is the Absolute Truth.

12) Here "worship" is defined,—it is inward (reverence), and outward (bowing down). (As to prostration see Josh. vii. 16.—Neh. viii. 6.)

13) The regular daily devotions of the Jews from the most ancient times (see Psalm lv: 17., Danl. vi: 10). The Biblical hours were as follows: 9 a. m. (Acts ii: 15), 12 m. (Ps. lv: 17), 3 p. m. (Acts iii: 1; x. 3).

之蘊奧、然道必本於清眞禮拜、清者精一無二、眞者正而無邪、禮者敬而已矣、拜下禮也、人於日用之間、不可傾刻而忘乎天、惟寅午戌而三次禮拜、乃眞實天道之理、祖賢一敬之脩何如、必先沐浴清其天君、正其天官、而恭敬進於道經之前、道無形像、儼然天道之在上、姑述禮拜綱領而陳之、始焉、鞠躬敬道、道在鞠躬也、中立不倚敬道、道在中立也、靜而存養默贊敬道、不忘乎天也、動而省察鳴贊敬道、不忘乎天也、此教之所以望空禮拜也、退三步也、忽然在後、敬道後也、進五步也、瞻之在前、敬道前也、左之鞠躬敬道、卽善道在於左也、右之鞠躬敬道、卽善道在於右也、仰焉敬道、道在上也、俯焉敬道、道在邇也、終焉而拜道、敬在拜也、噫、敬天而不尊祖、非所以祀先也、春秋祭其祖先、事死如事生、事亡如事存、維牛維羊、薦其時食、不以祖先之既往而不敬也、每月之際、四日齋戒、乃入道之門、積

PLATE 2.

The form (of worship) observed by the virtuous men of antiquity was, first to *bathe*[1] and wash their hands,[2] taking care at the same time to purify their hearts, and correct their senses,[3] after which they reverently approached Eternal Reason[4] and the *Sacred Writings*. Eternal Reason is without form or figure, like the Eternal Reason of Heaven, exalted on high.

We will here endeavor to set forth the general course of divine worship in order.[5]

First, the worshipper, bending his body,[6] does reverence to Eternal Reason,[7] by which means he recognizes Eternal Reason as present in such bending of the body: then standing upright in the midst, without declining,[8] he does obeisance to Eternal Reason as standing in the midst.

In stillness, maintaining his spirit, and silently praising, he venerates Eternal Reason, showing that he incessantly remembers Heaven; in motion, examining himself,[9] and lifting up his voice,[10]

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1) In the temple at Jerusalem no priest could serve in the priests' court at the sacrifices, etc., without first bathing the whole body.

2) After the general bath (the washing of the whole body), only the feet and "hands" were required to be washed again during the day—but this was necessary each time the temple was entered for service by the priests. (Edersheim, The Temple, its Ministry and Services" etc., p. 121). The superintending priest at the Temple, when calling those on duty to prepare for the casting of lots for the morning sacrifice, said aloud: "All ye who have washed come and cast lots." Mishnah—Tamid, i: 1, 2).

3) This may refer to what the Bible calls "afflicting the soul," i. e., sacrifice of the personal will. (See Smith's Dict.)

4) I cannot but see in this Eternal Reason something more than the everlasting truth of God. It seems here to be the Divine Presence (Λογος). The editor of the original translations sees the Logos in every instance.

5) This refers to the worship by the individual, and not to the whole course of public worship.

6) The Rabbins were very precise as to the details of individual worship, both for priests and people. As to "bending the body," the Mishnah enjoins that the body be completely bent, with care to avoid the appearance of bodily fatigue. This applies generally to worship in the synagogues. (comp. I. Saml. i: 26., Matth. vi: 5.) (Edersheim,—"Jewish Social Life," p. 276.)

7) Here, and all through this description of worship, we must consider Eternal Reason to be the Divine Presence.

8) If this refers to worship in the temple at Kai-fung-foo. the person probably stood as in the temple at Jerusalem; i. e. facing the Holy of Holies. The feet according to the Rabbins were to be placed close together, and the hands crossed over the breast. (Edersheim, Temple, etc. p. 127). The worshipper was to "stand as a servant before his master, with all reverence and fear." (Edersheim, and Lightfoot De Minis, Temp).

9) i. e. paying strict attention to his person.

10) i. e. either in prescribed formulæ or free prayer—the latter especially in private devotion. In praying the hands were raised and spread, not folded.

善之基、謂之入、則今日積一善、明日積一善、始積累至齋、諸惡莫作、衆善奉行、七日善終、週而復始、如易有云、吉人爲善、惟日不足之意、四季之時七日戒衆祖苦難、祀先報本、亡絕飲食、一日大戒、敬以告天悔前日之過遷今日之善也、易有云、風雷益、君子以見善則遷、有過則改、噫、教道相傳、授受有自來矣、出自天竺、奉命而來、有俺、李、艾、高、穆、趙、金、周、張、石、黃、聶、左、白、等、七十姓、進貢西洋布、宋帝曰歸我中原、尊守祖風、留遺汴梁、宋孝隆興元年癸未、列微五思達、領掌其教、俺都剌始建寺焉、元至元十六年己卯、五思達重建古刹清眞寺、坐落土市字街東南、四至三十五杖、殆我大明太祖高皇帝開國、撫綏天下軍民、凡歸王化者皆賜地以安居樂業、誠一視同仁之心也、惟是寺不可無典守者、惟李誠、李實、俺平徒、艾敬、周安、李綱等、正經熟曉、勸人爲善呼爲滿剌、至今衣冠禮樂、遵行時制、言語動

PLATE 3.

honors Eternal Reason,—showing that he unfailingly remembers Heaven. This is the way in which our religion teaches us to look towards invisible space[1] and perform our adorations. Retiring three paces[2] the worshipper gets suddenly to the rear, to show his reverence for the Eternal Reason who is behind him. Advancing five steps he looks on before, to show his reverence for the Eternal Reason who is in front of his person; he bows to the *left*, reverencing Eternal Reason, who is on the left; he bows to the *right*, reverencing Eternal Reason, whereby he adores the Eternal Reason who is on his right; looking *up*, he reverences Eternal Reason, to show that he considers Eternal Reason as above him; looking *down*, he reverences Eternal Reason, to show that he considers Eternal Reason as close to him. At the close, he worships[3] Eternal Reason, manifesting reverence in this act of adoration.

But to venerate Heaven and to neglect Ancestors, is to fail in the services which are their due.[4] In the Spring and Autumn,[5] therefore, men sacrifice[6] to their ancestors, to show that they serve

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1) i. e. towards no visible object, but towards God.

2) This "retiring three paces" and all that follows appear to be accretions from the Chinese ceremonies. I am not acquainted with any references in the Talmud to such ceremonies as these. Yet there is a Jewish idea through them all, since they are intended to show a faith in the omnipresence of Jehovah.

3) This Chinese-Jewish worship consisted in internal "reverence," and in external "bowing to the ground." Cf. I. Kings, xviii: 42,—Neh. viii: 6.

4) Ancestor-worship became a vital point in Chinese Hebraism.

5) i. e. at the Spring and Autumn equinoxes. These times were chosen by the Chinese for the worship of Heaven. Chinese equinoctial ceremonies I believe to be the survivals of a primitive Sun-worship.

6) The Chinese offered a "sheep" in honor of each new moon. See Confucian Analects, B. 3: 18.
I would not however have it understood that the Jews copied after the Chinese as to the Spring and Autumn "sacrifices." The Chinese indeed worship with greatest ceremony at the Spring Equinox, but the Jewish "passover" also occurred at the same time of the year, in the month Nisan, or about April 1. Again the great feast of "Tabernacles" occurred at the Autumn Equinox, in the month Tishri, or about October 1. Thus we can see in the spring and autumn ceremonies of the Chinese Jews, survivals of the Biblical festivals, but there were never any bloody sacrifices offered in the Kai-fung-foo temple, since Jews went to China in Mishnic days, and knew well of the end of Jewish sacrificial worship. As no Jewish sacrifices were actually offered in China, I can only hold to one of two things, i. e.: either that we have here a proof of the corrupted continuance of the "Passover," accompanied by the slaughter of animals, oxen as well as sheep; or else we have a mere reference to the worship of the Chinese. The strange part of it all is, if it refers to Jewish worship, the fact that all these offerings being in honor of ancestors,—a view semingly far removed from the Biblical; and yet, were not the Old Testament usages of "Passover" really intended to honor ancestors as well as to show thanks to Jehovah? How easily transmutable was this Jewish feast into a

靜、仍由舊章、人人守成法、而知敬天尊祖、忠君孝親者、皆其力也、俺誠醫士、永樂十九年奉周府定王傳令、賜香清眞寺重修、中奉大明萬歲牌、永樂二十一年以奏聞有功、欽賜趙姓、錦衣、都指揮、陞浙江指揮、正統十年李榮等、重建前殿三間、至天順五年河水淹沒、基址畧存、艾敬等具呈按照先例、奉本府承河南布政司劄付等因、至元年古剎清眞寺准此、李榮復備資財、煥然一新、成化年高鑑自備財修后殿三間、安置道經三部、此蓋寺前後來歷也、天順年石斌、高鑑、張瑄、取寧波本教道經一部、寧波趙應承捧道經一部、賫至汴梁、迺弟瑛自備財、弘治二年置寺地基一段、瑛與鏜托趙俊置碑石、俺都剌立基址、啟其端、諸姓捨資、置經龕諸物器皿等件、周圍畫飾之用、壯麗一方、愚惟三教各有殿宇、尊崇其主、在儒則有大成殿、尊孔子、在釋則有聖容殿、尊尼牟、在道則有玉皇殿、在清眞則有一賜樂業殿、尊崇皇天、本教

the dead, as they do the living, and pay the same respect to the departed as they do to those who survive. They offer sheep and oxen, and present the fruits of the season.

This offering of sheep and oxen and presenting the fruits of the season,[1] is to show that they do not neglect the honor due to ancestors, when they are gone from us. During the course of every month we fast and abstain four times,[2] which constitutes the door by which religion is entered and the basis on which goodness is accumulated.

It is called an *entrance*[3] because we practice one act of goodness to-day and another to-morrow. Thus having commenced the merit of abstinence,[4] we add to our store, avoiding the practice of every vice, and reverently performing every virtue.[5] Every seventh day[6] we observe a holy *rest*, which, when terminated, begins anew;[7] as it is said in the *Book of Diagrams*,[8] "the good man, in the practice of virtue, apprehends lest the time should prove too short." At each of the four seasons[9] we lay ourselves under a seven days restraint, in remembrance of the trials endured by our

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Chinese one! In the letter sent by the Jews of China through Consul Layton, at Amoy, in answer to a letter of inquiry sent by Mr. Finn (see Finn's "Orphan Colony of Jews in China") mention is made of the observance of several feasts and fasts by the Chinese Jews, and among them are "Unleavened Bread" or "Passover," and "Pentacost," but apparently not "Tabernacles." Thus we know that "Passover" was observed in China in our own day; the only question being that of the accompanying ceremonies, and whether the above reference is to "sheep" and "oxen" offered at the corrupted Chinese-Jewish Passover, or not; at any rate, there is an evident confusion of Jewish with Chinese practices.

1) This is a survival of the Old Testament offering of the "first fruits," but how different is the object of all these offerings! In the Old Testament it was God, but here it is only ancestors! It is a mixture of Chinese and Jewish worship.

2) I suppose this excludes the four national festivals. Concerning the above I know nothing.

3) Or "a door," i. e. fasting is here held to be the best means toward the spirit of true holiness, this fasting at the same time arousing the spirit of self-denial in other ways.

4) i. e. abstinence is the beginning of many other meritorious acts.

5) The Chinese Jews evidently did not make of fasting and abstinence a mere cloak for righteousness.

6) i. e. at the end of every week. The Sabbath was always observed in the Jewish Colony in China (see Finn's "Orphan Colony").

7) This is an apparently abstruse statement, and can be understood, perhaps, to mean that every day should be to man as a Sabbath—a view in accord with the succeeding quotation from the Chinese.

8) This is an extremely ancient and mysterious book in the catalogue of the Chinese Classics. It may be the most ancient of their books.

9) i. e. the 4th, 5th, 7th and 10th months of the Jewish ecclesiastical year.

與儒教雖大同小異、然其立心亦不過敬天尊祖、忠君孝親、五倫五常、三綱而已矣、噫嘻人徒知清眞寺禮拜、敬天拜空、殊不知道之大原出于天、古今相傳不可誣也、雖然本教尊崇如是之篤、豈徒求福田哉、亦不過受君之恩、食君之祿、惟盡禮拜之誠、忠君報國之意、祝聖壽於萬年、皇圖鞏固、願天長於地久、風調雨順、共享太平之福、勒之金石、永傳久遠云、

開封府增廣生員　金鍾撰

祥符縣廩生　曹左書

開封府廩生、　傅儒篆

弘治二年歲在己酉仲夏吉日清眞後人立

PLATE 5.

ancestors,[1] by which means we venerate our predecessors and reward our progenitors.[2] We also abstain entirely from food during a whole day,[3] when we reverently pray to Heaven, repent of our former faults, and practice anew the duties of each day. The *Book of Diagrams* also says, "when the wind and thunder prevail, the good man thinks of what virtues he shall practice,[4] and if he has any errors he reforms them.

Thus our religious system has been handed down and communicated from one to another. It came originally from *Theen-Chuh.*[5] Those who introduced it in obedience to divine command,[6] were seventy clans,[7] viz., those of Yen, Le, Gae, Kaou, Chaou, Kin, Chow, Chang, Shih, Hwang, Nee, Tso, Pih, etc. These brought as tribute some Western cloth.[8]

The emperor of the *Sung* dynasty said: "Since they have come to our central land, and reverently observe the customs of their ancestors, let them hand down their doctrines at *Peen-leang*.[9] In the first year of *Lung-hing*, of the *Sung*[10] dynasty, in the 20th year of the 65th cycle,[11] *Lee ching* and Woo-sze-ta[12] superintended this religion, and *Yen-too-la*[13] built the Synagogue.[14] In the reign of *Che-yuen*, of the Yuen dynasty,[15] or the 16th year of the 67th

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1) These "trials" refer to the capture of Jerusalem by Nebuchadnezzar. The destruction of the first temple (and afterwards the second), the slaughter of Gedaliah and his company at Mizpah (Jer. xli: 1), and the siege of Jerusalem by Nebuchadnezzar.

2) This is the expression of a Chinese-Jewish Ancestor-worshipper.

3) i. e. on "the day of atonement." (10th of Tishri.) This fasting was from Sundown to Sundown. It seems to have been kept very faithfully, and in wonderful purity in the midst of paganism.

4) i. e. in the presence of impending destruction.

5) I have already stated that this was India, but, according to my researches, more particularly the region around Cabul, a great center of Jewish caravan trade.

6) These Jews evidently held their migration to China to have been by divine command.

7) i. e. about 5,000 people.

8) The text says, "Si yang pu," i. e. cloth from the Western Ocean. T. de L.

9) i. e. the modern Kai-fung-foo. The permission to settle was evidently granted the Jews by the emperor on account of their devotion to their religion and their "ancestors!"

10) This was the great Sung dynasty. The date here referred to was 1163 A. D. (The "Shang-hae pamphlet" says 11 6. See p. 71. of that public.)

11) I consider these two individuals to have been Rabbis.

12) This person was probably a rich Jewish layman.

13) i. e. Temple.

14) i. e. the Mongol dynasty, preceding the native Ming.

15) i. e. 1279 (the Shang-hae pamphlet says 1280).

cycle,[1] Woo-sze-ta rebuilt the ancient temple of truth and purity, which was situated in the T'hoo-she-tsze-street, on the southeast side.[2] On each side the area of the temple extended 350 feet. When the first emperor of the *Ming* dynasty[3] established his throne and pacified the people of the empire, all those who came under the civilizing influence of our country were presented with ground, on which they might dwell quietly, and profess their religion without molestation, in order to manifest a sympathizing benevolence, which views all alike.[4] But as this temple required some one to look after its concerns, there were appointed for that purpose[5] *Le Ching*, *Le Chih*, *Yen Ping-too*, *Gae King*, *Chow Han*, *Le Kang*,[6] etc., who were themselves upright and intelligent men, and able to admonish others, having obtained the title of Mwan-la.[7] So that up to this time (1488), the sacred vestments, ceremonies and music are all maintained according to the prescribed pattern, and every word and action is conformed to the ancient rule.[8]

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1) There is no mention, as far as I can discover of any Jewish temple at Kai-fung-foo before the year 1163. Between this date and 1279 the temple must have been destroyed by an inundation of the Yellow River, unless the word "ancient" refers to a structure set up and destroyed centuries before the temple of 1163, which is improbable.
I rather hope that future research may result in discovering the existence of a temple soon after the middle of the 5th century A. D., but as yet there are no strong indications of such.

2) About half the temple area of Solomon's temple (for a ground plan of the temple, see "Menorah," September, 1888).

3) i. e. the native Chinese dynasty succeeding the foreign Mongol, in the year 1368.

4) This is the general humane policy of the Chinese emperors.

5) i. e. by the Emperor.

6) A reference to the names of some of the "seventy clans" (p. 250) will suffice to show that the above-named persons were descendants of the first settlers,—they were among the prominent Jewish families.

7) I think this is the Chinese phonetic rendering of the English Mollah (Turk, Mewla or Molla), the name of the higher order of Turkish Ecclesiast. Judges (Webster). The Mahometan influence was very great at Kai-fung-foo, and many Turkish and Arabian words were imposed on the Chinese; and as the Jews were confounded with the Mahometans by the Chinese, it happened that this Chinese-Turkish title was bestowed by the emperors on several of the Jewish "Synagogue rulers."—On this word Dr. Porter Smith, "Vocabulary of Chinese Proper Names" (1870) writes: Mwan-lah, the Mullah, a Mahometan name used for the Jewish Rabbi at Kai-fung-fu. Col. H. Yule, "Glossary of Anglo-Indian Words" (1886), s. v. Moollah, refers to Hind. mulla, corrupted from the Arabic maula.—T. de L.

8) This is by no means wholly true. The whole atmosphere of the temple (save in its shape) was Chinese. The Priest or Rabbi wore a yellow cap while officiating, and a red umbrella was suspended or held by an attendant over his head. As to music, the Jews chanted; and Gozoni, a Roman Catholic missionary in China in the seventeenth century, says this chanting reminded him of the Jews of Italy. (See Milman, History of the Jews.)

Every man, therefore, keeps the laws and knows how to reverence Heaven and respect the patriarchs, being faithful to the prince and filial to parents,—all in consequence of the efforts of these teachers.[1] *Yen Ching*,[2] who was skilled in medicine,[3] in the nineteenth year of *Yung-lo*,[4] received the imperial commands communicated through Chow-foo-Ting-wang,[5] to present incense in the *temple of truth and purity*,[6] which was then repaired.[7]

About the same time also there was received the imperial tablet of the *Ming* dynasty, to be erected in the temple.

In the 21st year of *Yung-lo*,[8] the above named officer[9] reported that he had executed some trust reposed in him, whereupon the emperor changed his surname to *Chaou*,[10] and conferred upon him an embroidered garment and a title of dignity, elevating him to be a magistrate in Che-Keang province.[11] In the tenth year of Ching-t'hung,[12] *Le Lung* and some others rebuilt the three rooms in front of the synagogue.

It appears that in the fifth year of *T'heen-Shun*,[13] the Yellow River[14] had inundated the synagogue, but the foundations were still preserved; whereupon Gae King[15] and others petitioned[16] to be allowed to restore it to its original form; and through the Chief Magistrate of the prefecture,[17] received an order from the treasurer of Honan province,[18] granting that it might be done in conformity

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1) i. e. the above mentioned persons, who, according to the writer of this inscription, were "teachers" (i. e. religion)—or perhaps Rabbis.

2) In the name Yen we again discern a descendant of an original settler.

3) The only instance of the kind met with in my researches.

4) A. D. 1417 (Shang-hae pamphlet, p. 71).

5) He was an imperial officer of the province, and a Jew!

6) i. e. the Jewish temple. This "command" to "burn incense" was to burn it in honor of the emperor, before the imperial tablet which was set up in the Jewish temple according to custom, as a sign of loyalty.

7) It had again suffered from fire or flood.

8) The same person as the immediately preceding—the time is only two years afterward.

9) i. e. Chou-Foo-Ting-Wang, who was a Jew!

10) A very highly honored surname.

11) Lat. of its Cap. Ning-po=30°,.on the coast. This is one of several instances of the elevation of Jews to high offices.

12) A. D. 1465 (Shanghae Pamphlet, p. 72).—Really 1445.—T. de L.

13) A. D. 1319 (Shanghae Pamphlet, p. 72).—Really 1461.—T. de L.

14) The Hoang-ho.

15) The same person mentioned before as having been appointed with others to superintend the Temple on the establishment of the Ming dynasty in 1368.

16) The exact year of this petition is unknown—it must have been about 1465.

17) i. e. of Kai-Fung-Foo.

18) The province including the prefecture of Kai-Fung-Foo.

with the *old* form of the *temple of truth and purity* that had existed in the time of Che-yuen.[1] Whereupon Le Yung[2] provided the funds, and the whole was made quite new.[3] During the reign of Ching-hua,[4] Kaou Keen[5] provided the fund for repairing the three rooms at the back of the synagogue.

He also deposited therein three volumes[6] of the sacred writings. Such is the history of the front and back rooms of the synagogue.[7]

During the reign of *T'heen-shun*,[8] *Shih Pin*, *Kaou Keen*, and *Chang Heuen*[9] had brought from the professors of this religion at Ningpo[10] one volume of the sacred writings, while Chaou Ying-Ching, of Ning-po[11] sent another volume of the divine word, which was presented to the synagogue at Peen-leang.[12]

His younger brother *Ying*[13] also provided funds, and in the second year of *Hung-che*[14] strengthened the foundations of the synagogue.

Ying,[15] with myself *Chung*,[16] entrusted to *Chaou Tsun*[17] the setting up of the present tablet. Yen-Too-la[18] had already fixed the foundation of the building and commenced the work, toward the completion of which all the families contributed,[19] and thus provided the implements and furniture connected with the cells[20] for depositing the *Sacred Writings*, causing the whole synagogue to be

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1) 1296.

2) The same as above mentioned.

3) About 1465.

4) i. e. 1465-1488.—T. de L.

5) Again the surname (Kaou) of an original settler and prominent man appears.

6) i. e. rolls.

7) It would be useless to attempt a description of the Temple-building here.

8) A. D. 1440. ("Shang. Pamph." p. 72.)—1457-1469.—T. de L.

9) Again we discover the names of old and prominent Jewish families.

10) A seaport (lat. 30°). A considerable Jewish colony dwelt there for centuries.

11) An internal evidence of Jews at Ning-po.

12) Kai-fung-foo.

13) Another resident of Ning-po.

14) A. D. 1488 ("Shang-hae Pamph.") It was at this time that the Jews conceived the idea of setting up their tablets for posterity.—Did they foresee trouble?—Really 1489.—T. de L.

15) i. e. the Ying of Ning-po, who was probably on a visit to Kai-Fung with his brother.

16) This person is the "composer" of this tablet, as will be seen at the end. Chung is only the name corresponding to our Christian name, his family name being Kin, a member of one of the prominent and ancient families.

17) Unknown. } both, however, of prominent families.
18) Unknown. }

19) Evidence of prosperity at this time.

20) These "cells" were receptacles in the Holy of Holies at the west end of the Temple.

painted and ornamented and put into complete repair.[1] For I conceive that the three religions of China have each their respective temple, and severally honor the founders of their faith: among the *literati* there is the temple of Ta-Ching,[2] dedicated to Confucius; among the Buddhists there is the temple of *Shing-Yung*,[3] dedicated to *Ne-mow*;[4] and among the Taoists there is the temple of *Yuh-Hwang*. So also in the *true and pure religion* there is the temple of *Yih-sze-lo-nee*,[5] erected to the honor of Hwang-t'heen.[6] Although our religion agrees in many respects with the religion of the *literati*,[7] from which it differs in a slight degree, yet the main design of it is nothing more than reverence for Heaven and veneration for ancestors, fidelity to the prince and obedience to parents,[8] —just that which is inculcated in the *five human relations*,[9] the *five constant virtues*,[10] with the three principal connections of life.[11]

It is to be observed, however, that people merely know that in the *Temple of truth and purity* ceremonies are performed, where we reverence Heaven, and worship towards no visible object.[12] But they do not know that the great origin of *Eternal Reason*[13] comes from Heaven,[14] and that what has[15] been handed down from of old to the present day[16] must not be falsified.[17]

Although our religion enjoins worship thus earnestly, we do not render it merely with the view of securing happiness to ourselves,

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1) i. e. 1488.

2) Literally, "Great Perfection." (Shang-hae pamphlet). The Confucianists are the literati, or rather the latter are found mainly among them

3) "Sacred Countenance," (Shang-hae pamphlet)

4) i. e. Buddha.—Nama Amitabha Buddha.—T. de L.

5) Israel.

6) Literally, "high Heaven," or God (Jehovah).

7) Confucianists.

8) Here is a certain evidence of deterioration in Chinese Judaism

9) See tablet of 1511.

10) See tablet of 1511

11) The "Records of Rites" (Li-Ki) Book 24, § 8 explain the three great relations, as those of Husband and Wife Father and Son, Ruler and Minister. —T. de L.

In this whole paragraph, Chinese Judaism appears more a system of ethics, than a survival of the Old Testament teaching.

12) Here is a happy statement of the spiritual nature of Jewish-Chinese worship.

13) Here we again must translate "the everlasting truth of God."

14) I would here write "Heaven" with a small letter. It here means a place and not God.

15) i. e. by Jewish teachers.

16) i. e. 1488.

17) Their Judaism was, nevertheless, "falsified" to a greater or less extent. There may also be reference here to Deut. iv: 2.

but, seeing that we have received the favors of the prince, and enjoyed the emoluments conferred by him, we carry to the utmost our sincerity in worship, with the view of manifesting fidelity to our prince, and gratitude to our country.[1] Thus we pray that the emperor's rule may be extended to myriads of years,[2] and that the imperial dynasty[3] may be firmly established. As long as heaven and earth endure may there be favorable winds and seasonable showers, with the mutual enjoyment of tranquility.[4] We have engraved these our ideas on the imperishable marble, that they may be handed down to the latest generation.

Composed by a promoted literary graduate of the prefecture of Kai-fung-foo,[5] named *Kin-Chung*;[6] inscribed by a literary graduate of purchased rank, belonging to the district of Tseang-foo named *Tsaou-tso*;[7] and engraven by a literary graduate of purchased rank, belonging to the prefecture of Kai-fung-foo, named Foo-joo. Erected on a fortunate day[8] in the middle of summer, in the second year of Hung-Che,[9] in the forty-sixth year of the seventieth Cycle, by a disciple[10] of the *religion of truth and purity*.[11]

Appleton, Wis. A. KINGSLEY GLOVER.

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[1] An unselfish and humanitarian spirit of religion is here manifested.

[2] An example of the florid Oriental style of lauding rulers.—"King Darius, live forever." (Daniel).

[3] i. e. the native Ming dynasty (1368-1640).

[4] In the Empire.

[5] In the province of Honan

[6] This is the Chung who speaks of himself supra

[7] This person is otherwise unknown.

[8] The Chinese regarded certain days as "Fortunate." So did the Babylonians (Gottheil, in a letter to me, and Dr. de Lacouperie in June, 1887, issue of "Babylonian and Oriental Record").

[9] A. D. 1488.

[10] i. e. Chaou Tsun, mentioned supra.

[11] i. e. religion of Israel.

The Oldest Fairy Tale.

Translated from the Papyrus D'Orbiney, with Notes.

By REV. CHAS. E. MOLDENKE, PH. D.

Honorary Member of the Meriden Scientific Association.

The vast literature of the ancient Egyptians, as far it has come down to us in the monumental records, cannot lay claim to another story about which there has been so much said and written, as that of the "Tale of the Two Brothers." This is contained in the so-called Papyrus D'Orbiney, at present in the British Museum. Talk of the age of the Arabian Nights' Entertainments!—these bear in comparison the imprint of almost modern times, while this one Egyptian story stands over against them hoary with age. Even the stories of Chaldee, written on the cylinders of clay, are as nothing as to reference to age beside the Egyptian papyrus. Yet Egyptologists maintain that this story is even more venerable than would at first appear, because it is a matter of little doubt, that the papyrus we now possess is only a copy of some even more ancient manuscript. The word ar: in line 182 of the text undoubtedly means "copied." It was the chief librarian Ȧnana who undertook the work of copying the papyrus from some older copy that was on the shelves of his library.

One reason for the great interest attached to our papyrus since the time of its publication in 1860 up to the present day, is the fact that here we have a story quite similar in its narrative to the Biblical account of the temptation of the pure Joseph by the wife of Potiphar. We do not claim that Moses, who certainly knew and had studied the papyrus while a student at the University of Heliopolis, simply copied the situation, for only a slight portion of both accounts is similar, but he may have had the wording of our papyrus in mind while writing his story. At any rate we draw the conclusion from both accounts that such a sin as contemplated by the wife of Potiphar and the wife of Anubis was held in execration alike by Jewish as well as Egyptian morality and law.

Another reason for the interest extended to the papyrus is that it has proved a veritable mine for such of our Egyptologists who have turned grammarians, and especially those who, under the leadership of Erman of Berlin, are styling themselves the new school of Egyptology and are trying to fit the ancient, and we might say primitive language of Egypt into the tight shoes of our modern grammar. Grammatical expressions of great value to the linguist are, indeed, in abundance throughout the entire papyrus, but grammatical deductions drawn from the varied spelling of so-called verbal forms are nothing but a chimera. To set up a grammar with all the subtleties of expression as in a modern language any gain them from the spelling of words in a language where scribes would spell one and the same word in as many as twenty-five or more different ways is mere folly. The grammatical forms we *do* gain from the papyrus prove to us the ancient character of the Egyptian language, we may say its paucity but nevertheless terseness of expression. For this reason the papyrus is as valuable to us of the old school of Egyptology as to the adherents of the new school whose headquarters are in Berlin.

. We here present a transcription, transliteration, and translation of the important papyrus. We also append a few notes, grammatical and explanatory. In the course of reading the following pages no one can deny the truth of the words of Solomon, at least as far as human thoughts and expressions are concerned, that "there is no new thing under the sun." Human passions portrayed in our papyrus the way of thinking, the mode of expression—all combine to tell us that man's mind has not changed in the many thousands of years, and the wording of our story presents to us just such a tale as we expect to find in any books of the present day.

The papyrus is written in Hieratic and contains nineteen pages, all of about one size (ranging between 9⅞ x 8 inches to 12⅝ x 8 inches), except page VIII (18½ x 8 inches). On the back of the papyrus are three notices, one of them totally extraneous, and the other two appearing to be endorsements. The papyrus measures about 18⅔ feet, and is written in black and red ink, there being no red dots, however, which are usually found in copies of Egyptian poetry.

It was purchased in 1857 by the British Museum from Madame D'Orbiney, whence its name. Birch published it in lithographic fac-simile in "Select Papyri in the Hieratic Character. Part II. London, 1860."

some of the peculiarities of the papyrus are the frequent misspelling of words, omission of letters in the hurry of copying, the superabundance of letters and determinatives where they are not needed, and one correction in line 143. The handwriting is quite legible, one of the best to be found anywhere in Hieratic papyri, though ligatures or combination of signs are very frequent. In many places the papyrus is at present quite damaged and the words obliterated. Egyptologists have endeavored to restore all these lacunæ, each one in his own way, and they appear to have been successful in every instance, with the exception of the sentence in red ink in line 168, which has baffled the study and ingenuity of every scholar. Attention to these points will be called in the notes.

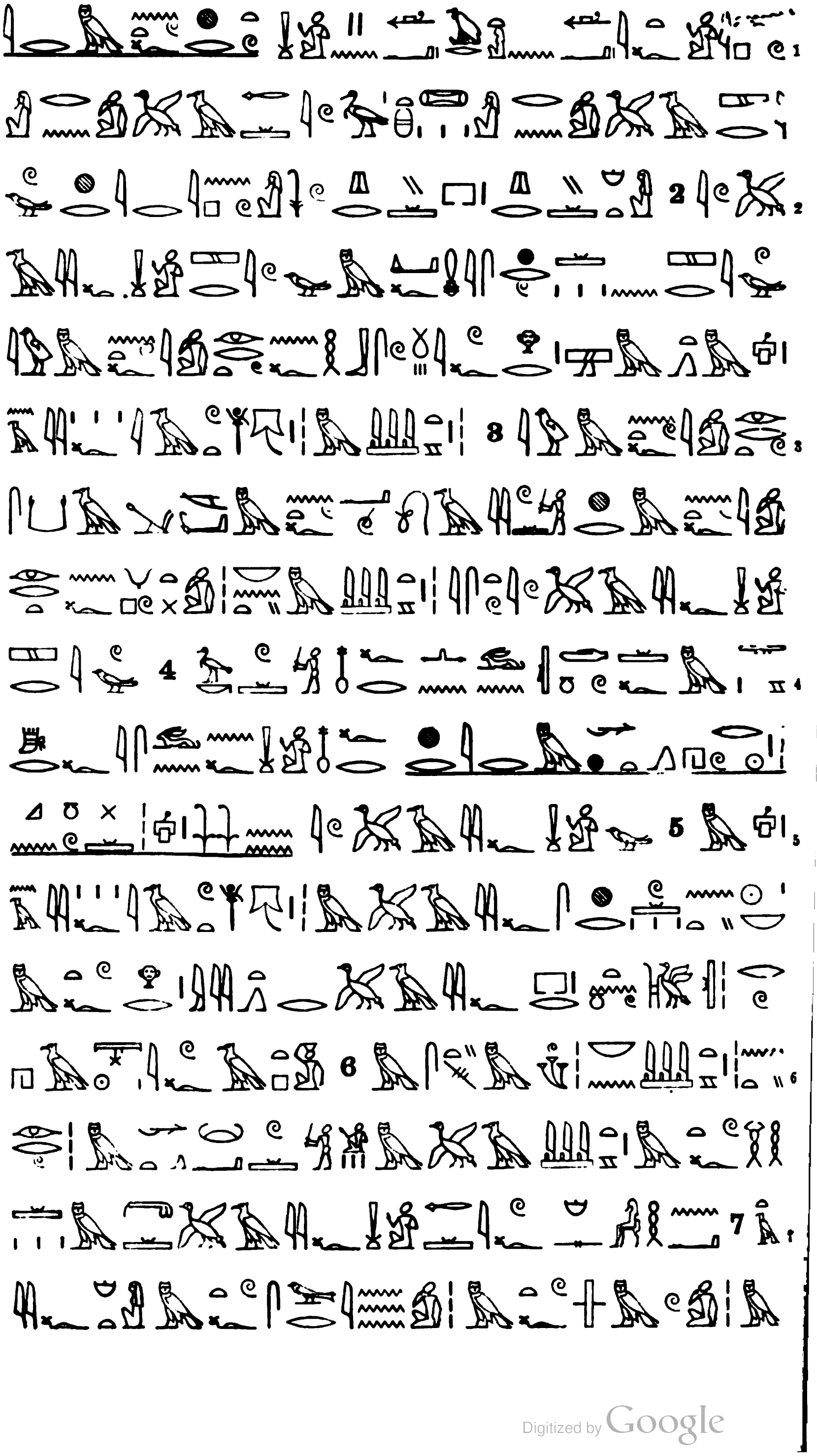
In the transcription all the characters in red ink are printed with a line below them, and in the translation the words of these red portions of the papyrus are in *italics*. To facilitate reference we number the lines in succession, doing away with the clumsy system of referring by pages and page lines, heretofore employed.

THE TALE OF
THE TWO BROTHERS.

A FAIRY TALE OF ANCIENT EGYPT,

BY

CHARLES E. MOLDENKE, A. M., PH. D.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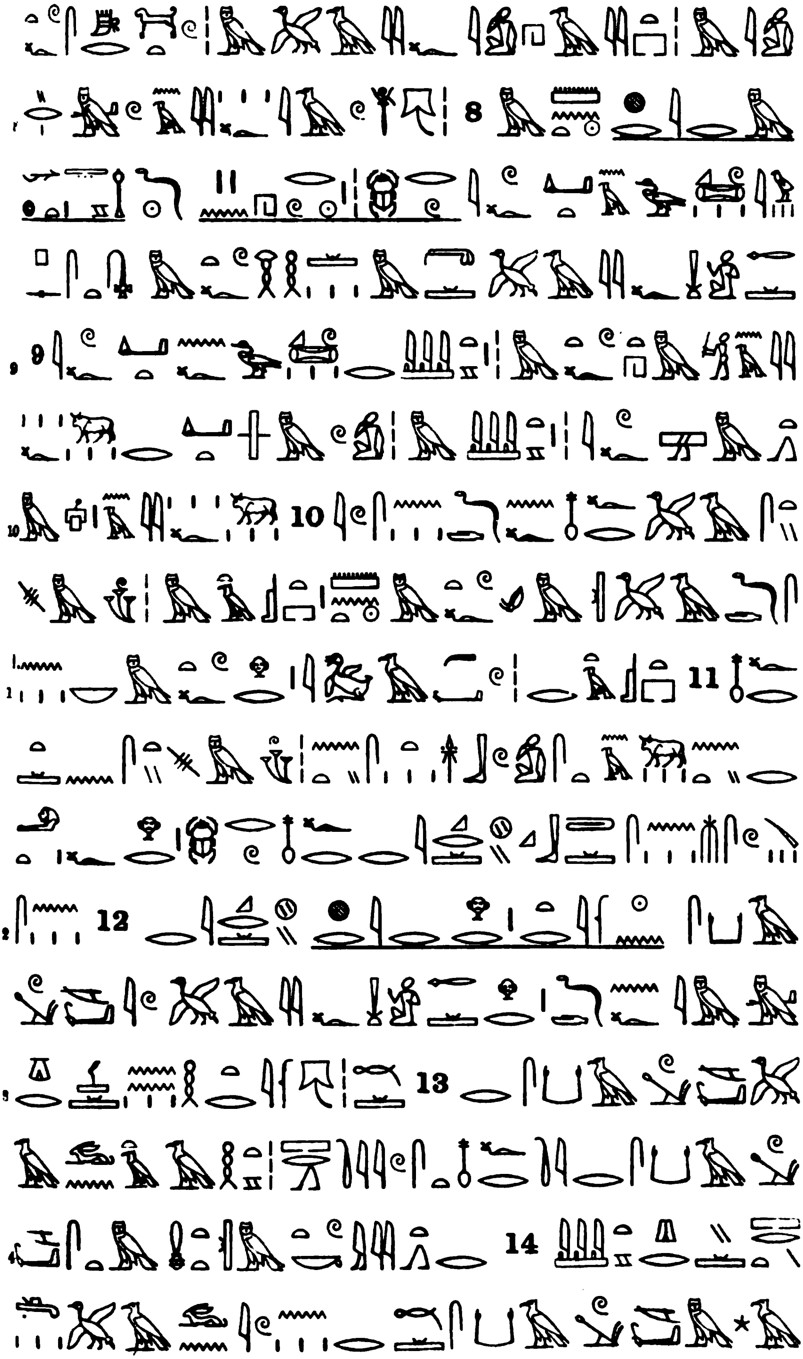
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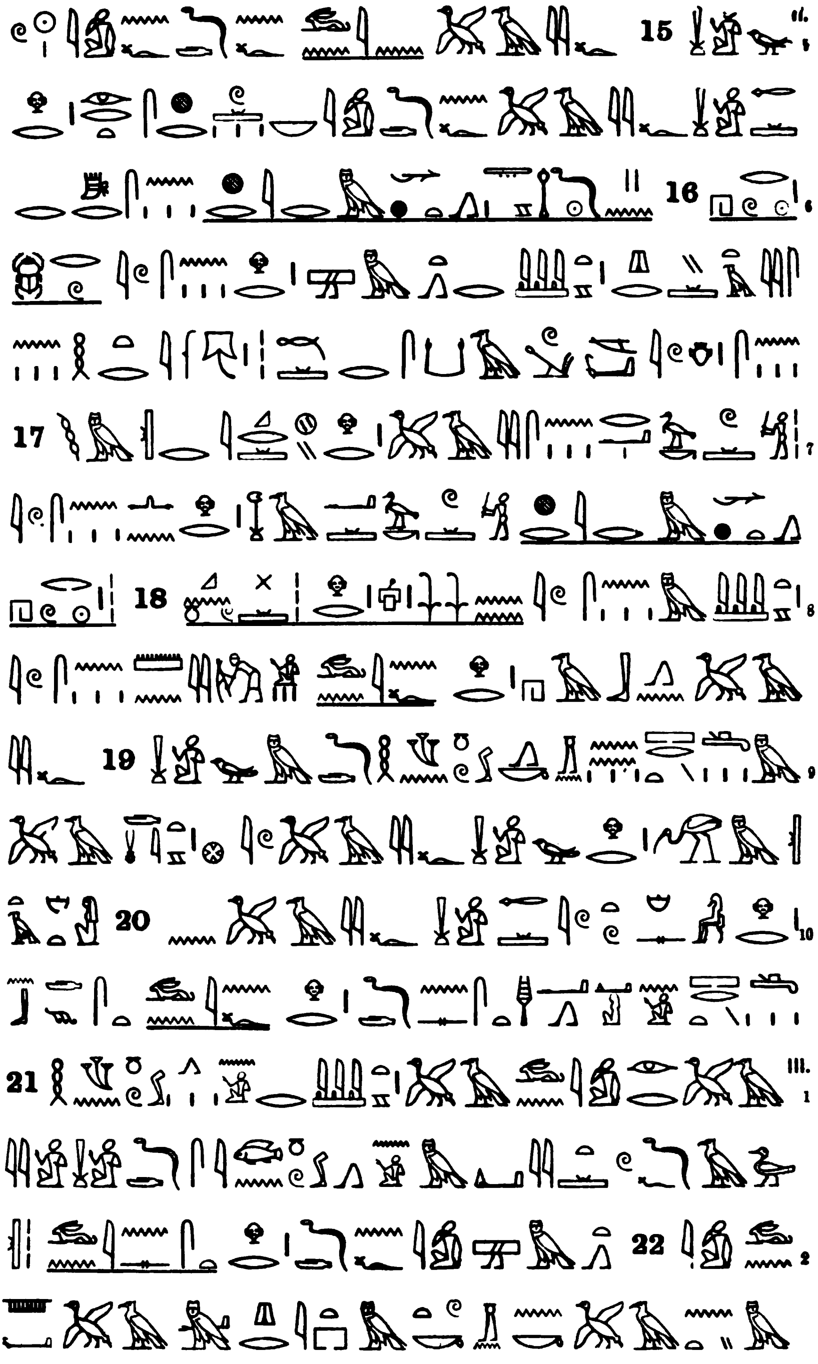
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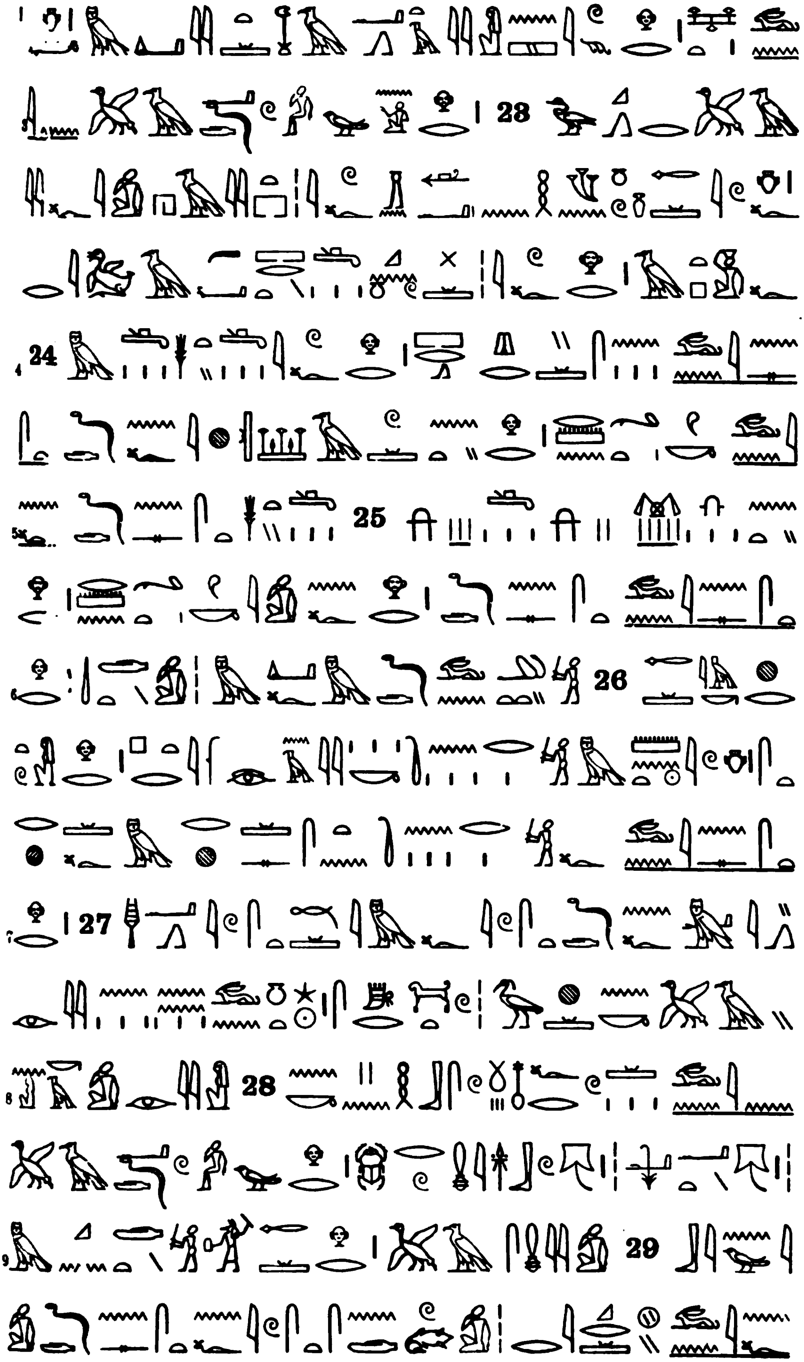
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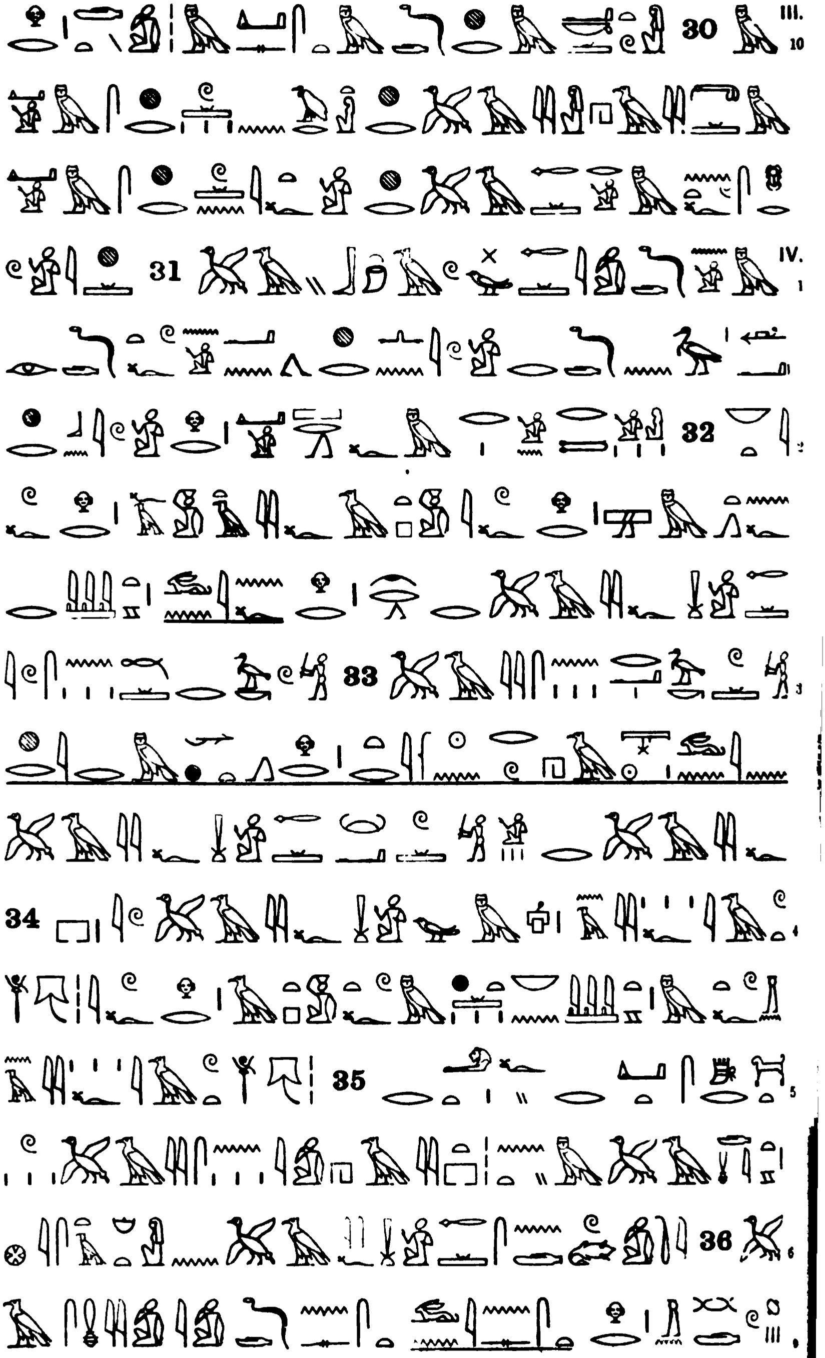
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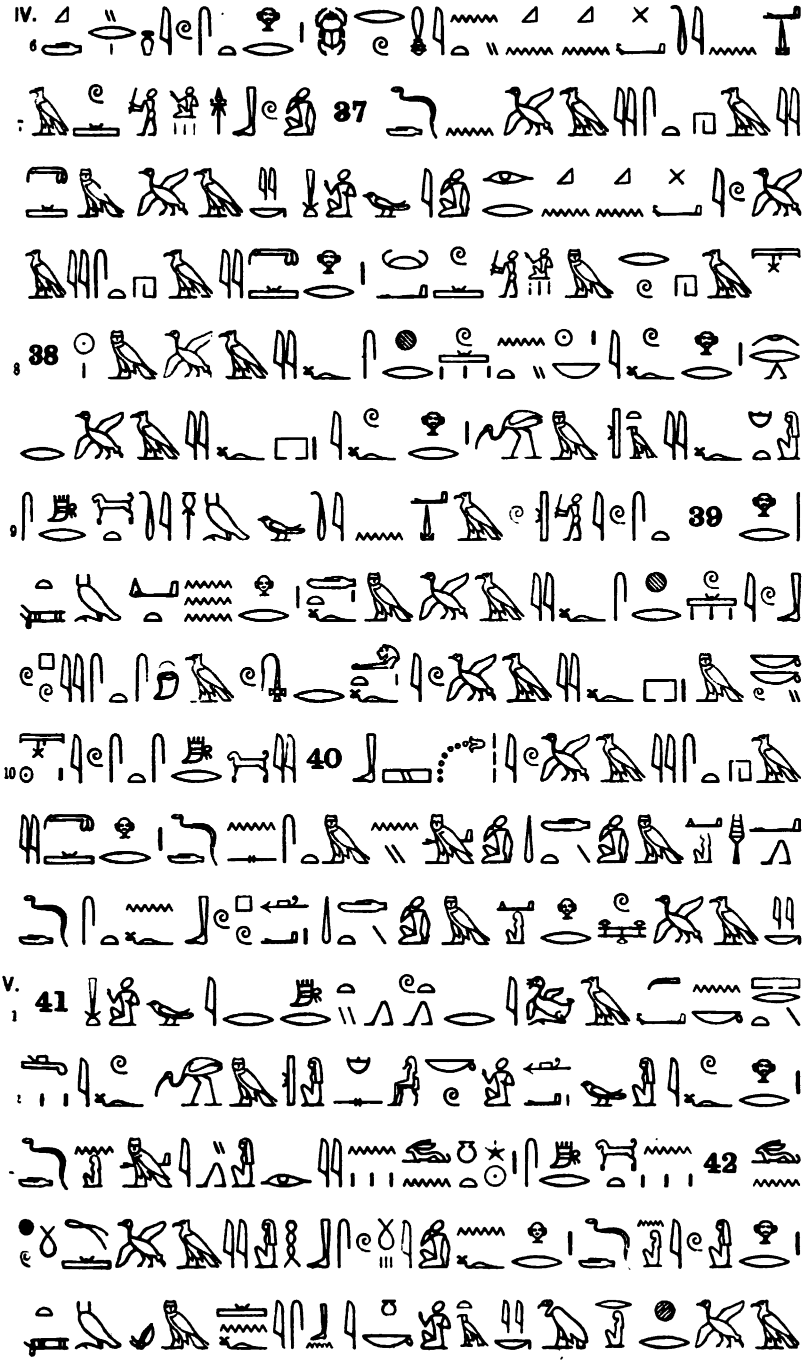
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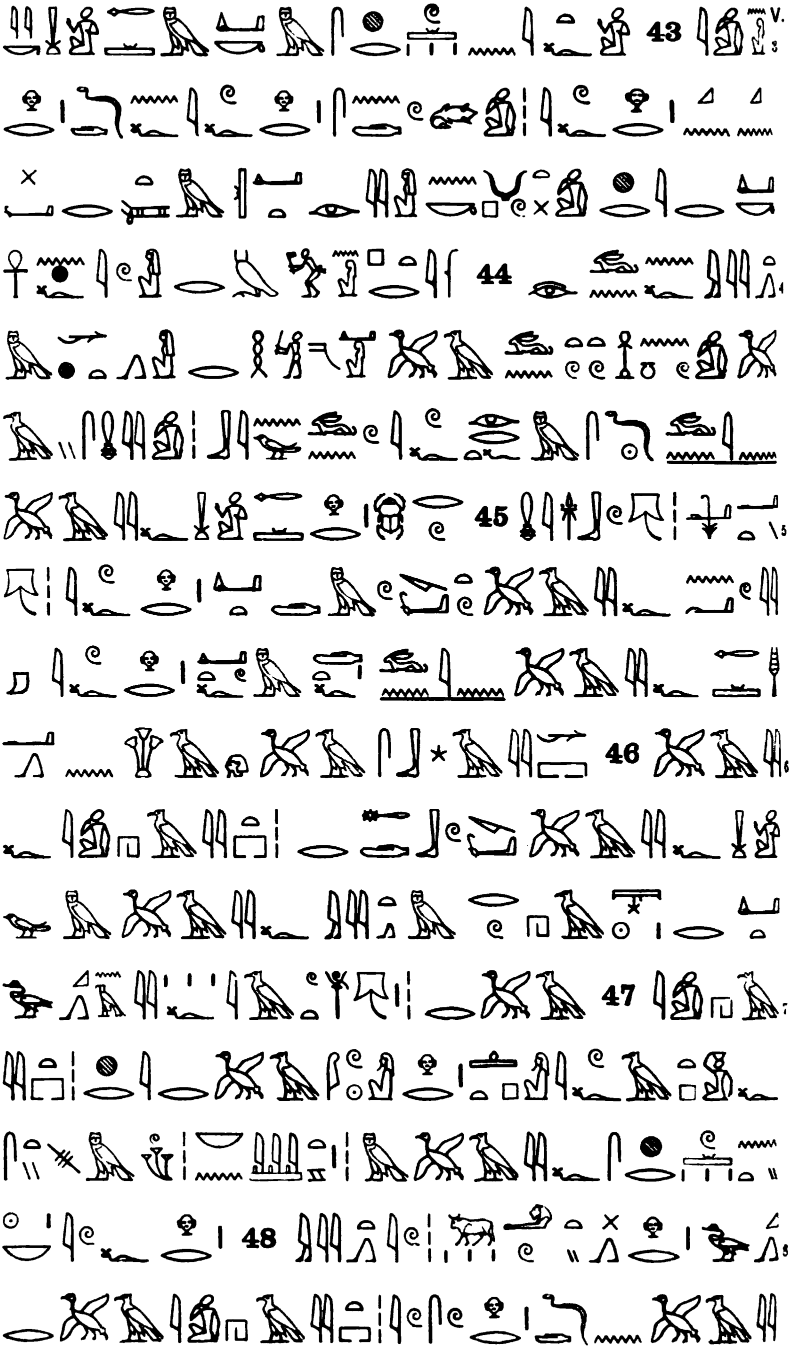
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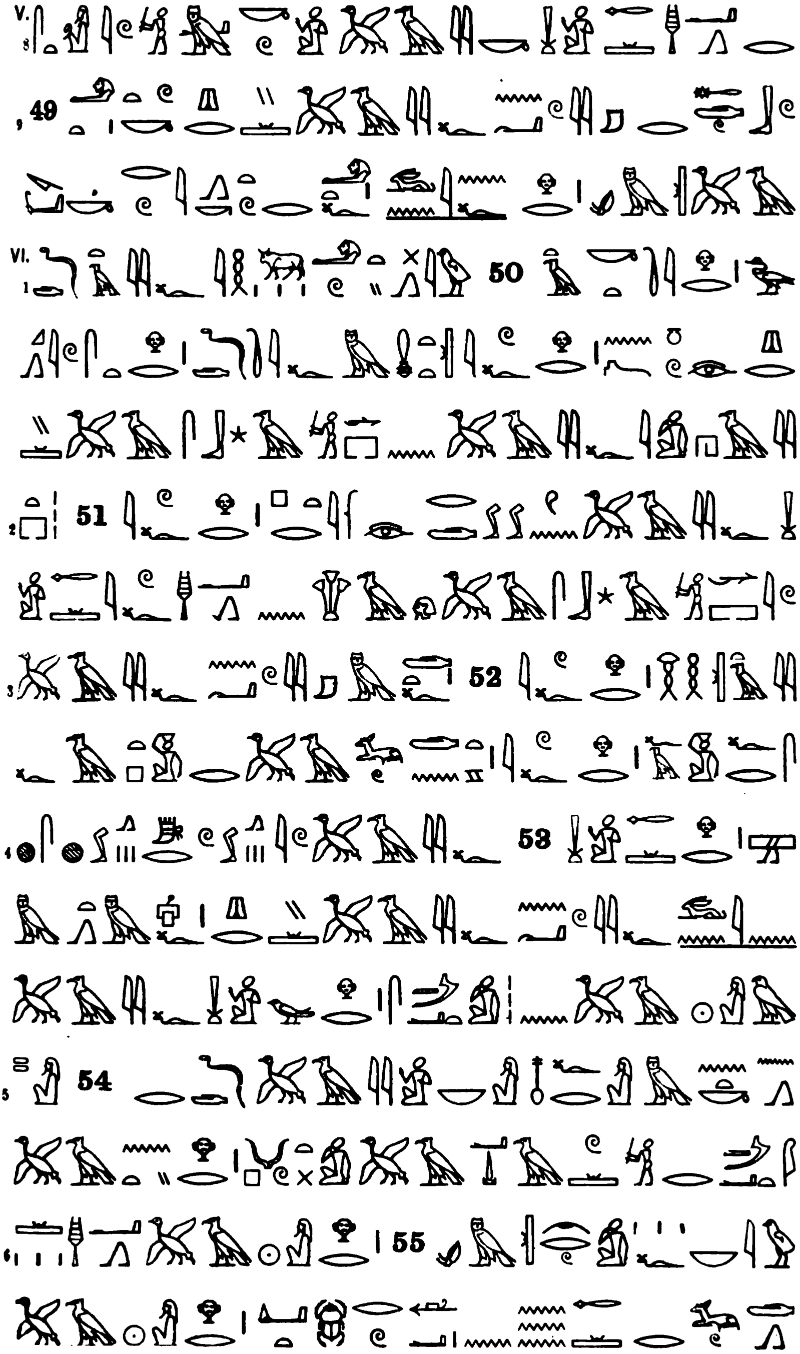
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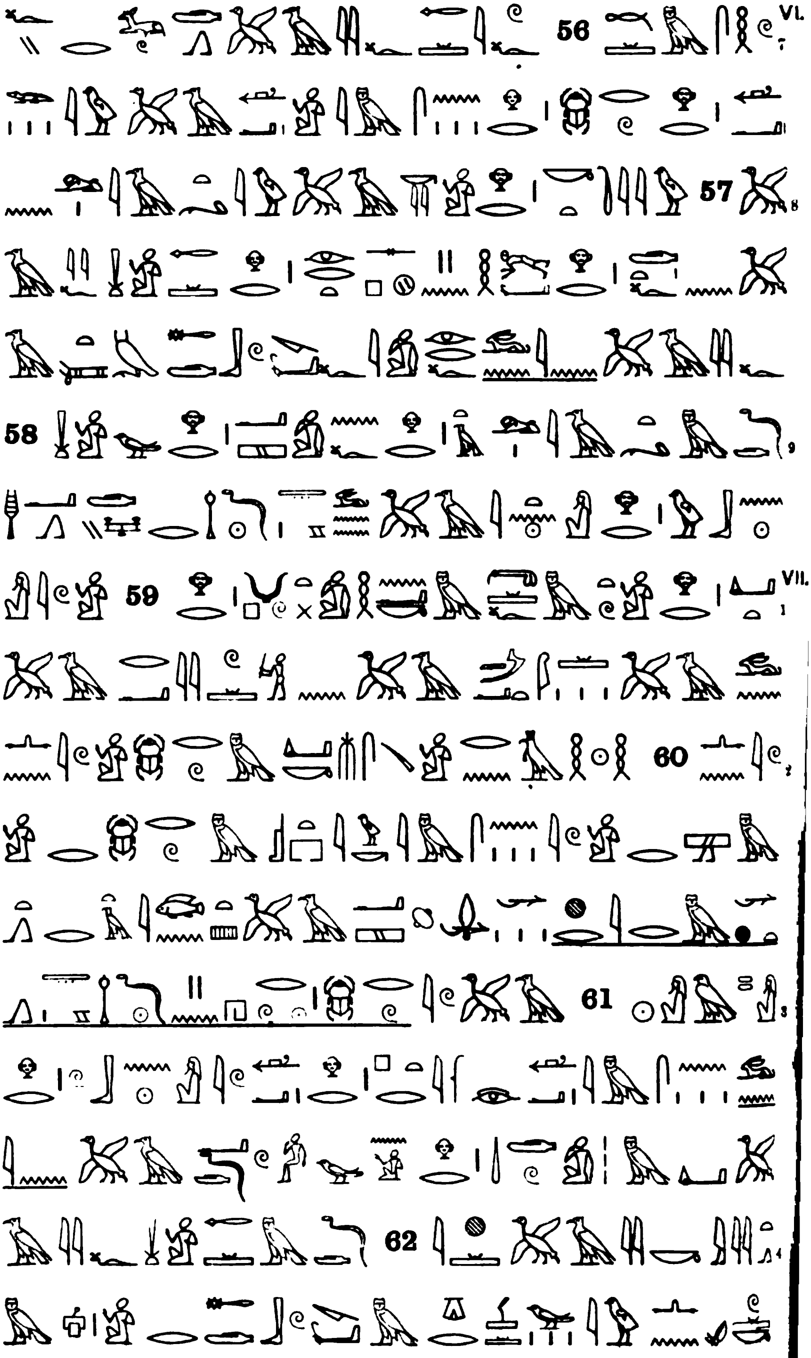
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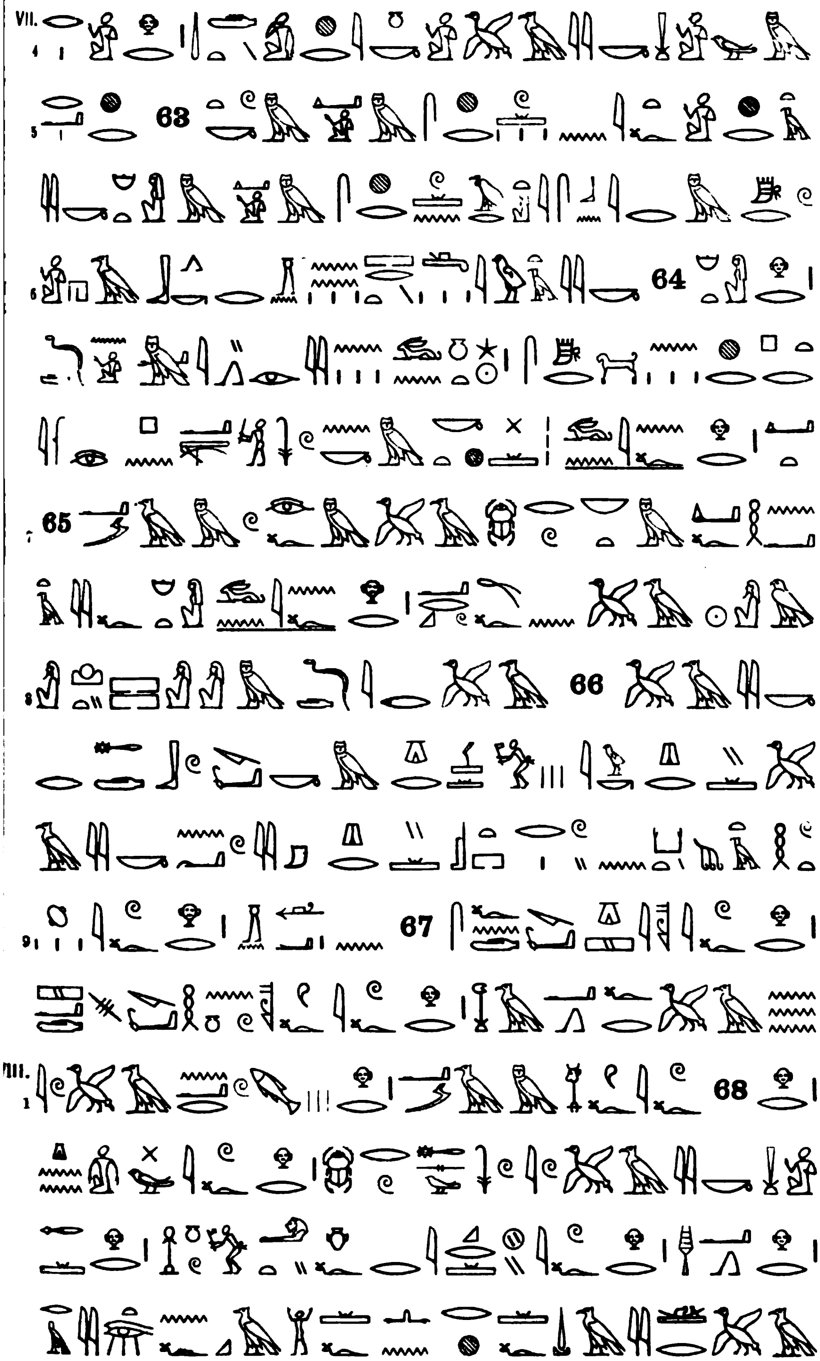
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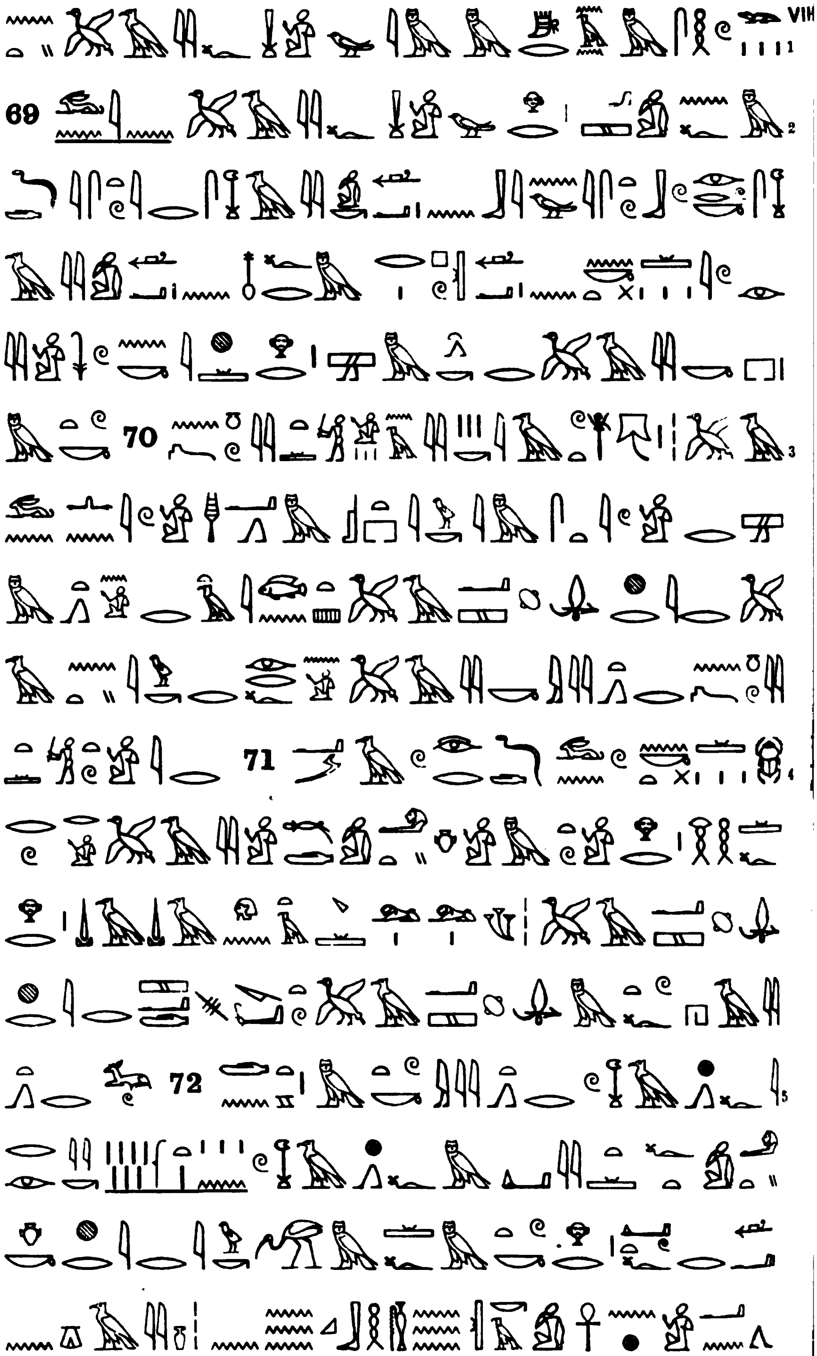
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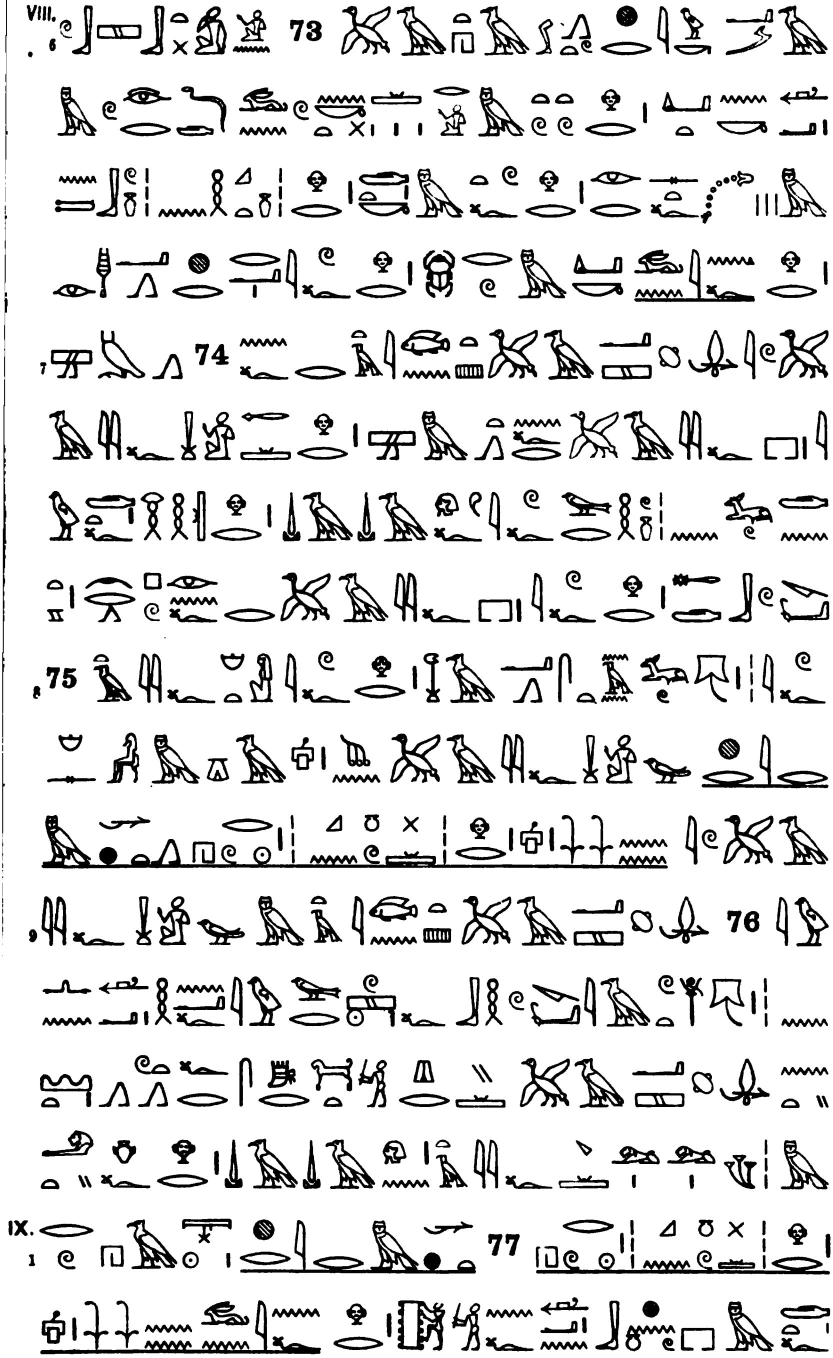
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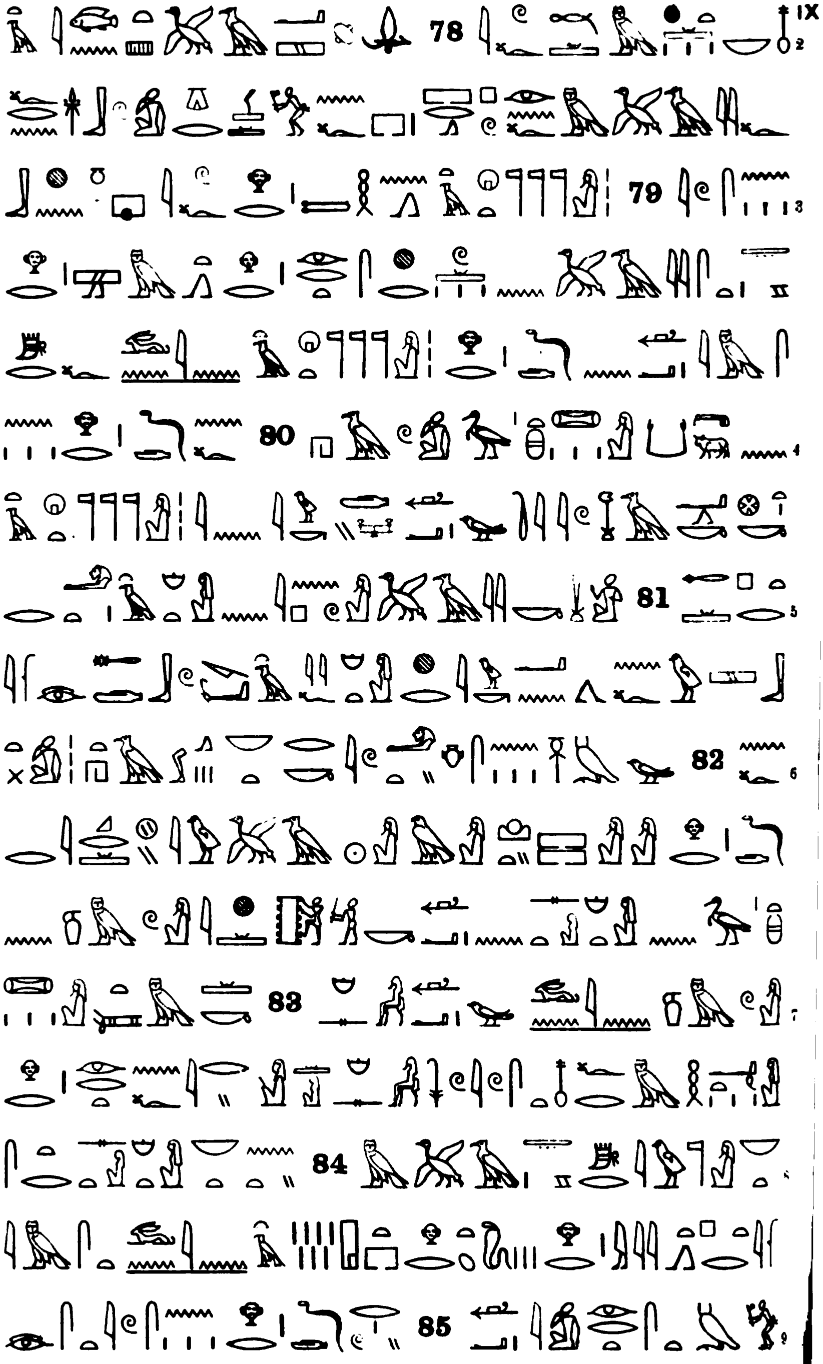
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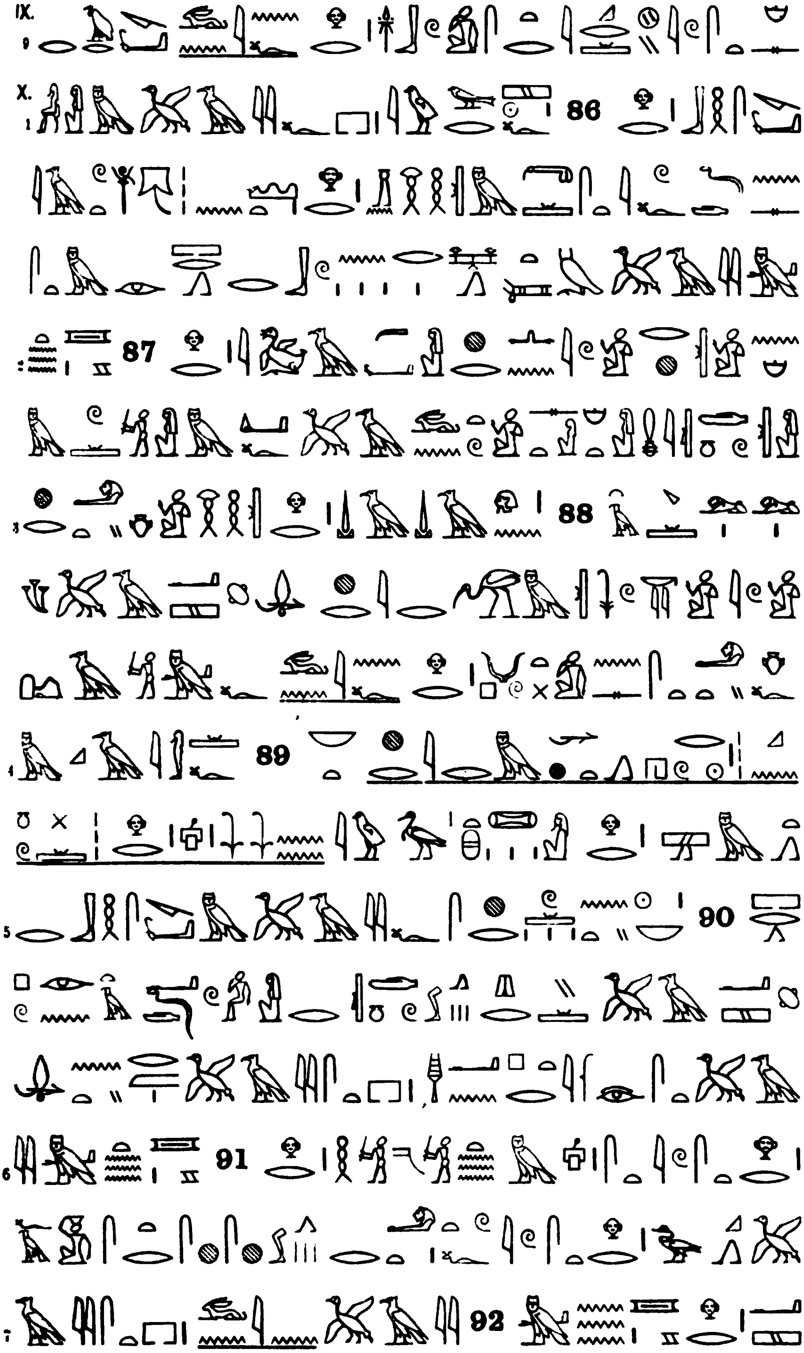
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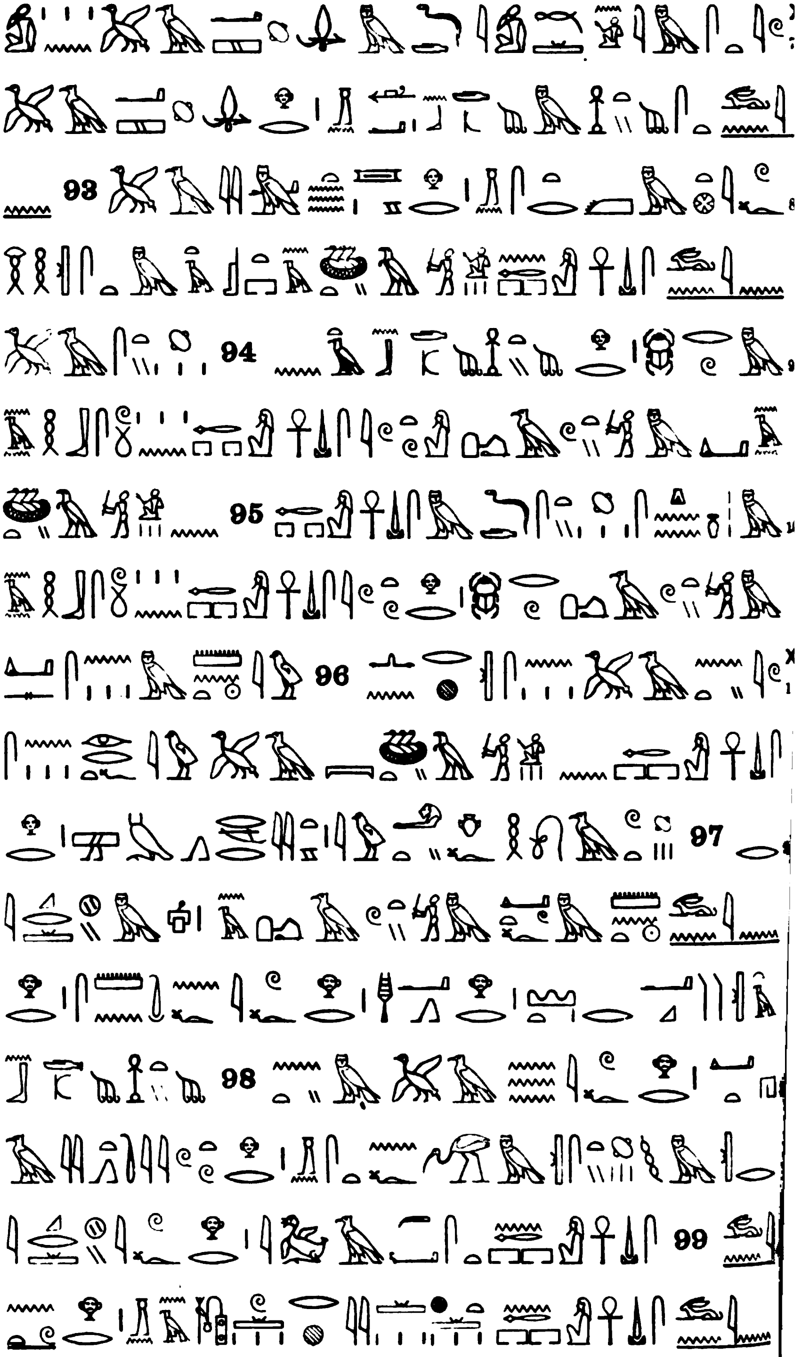
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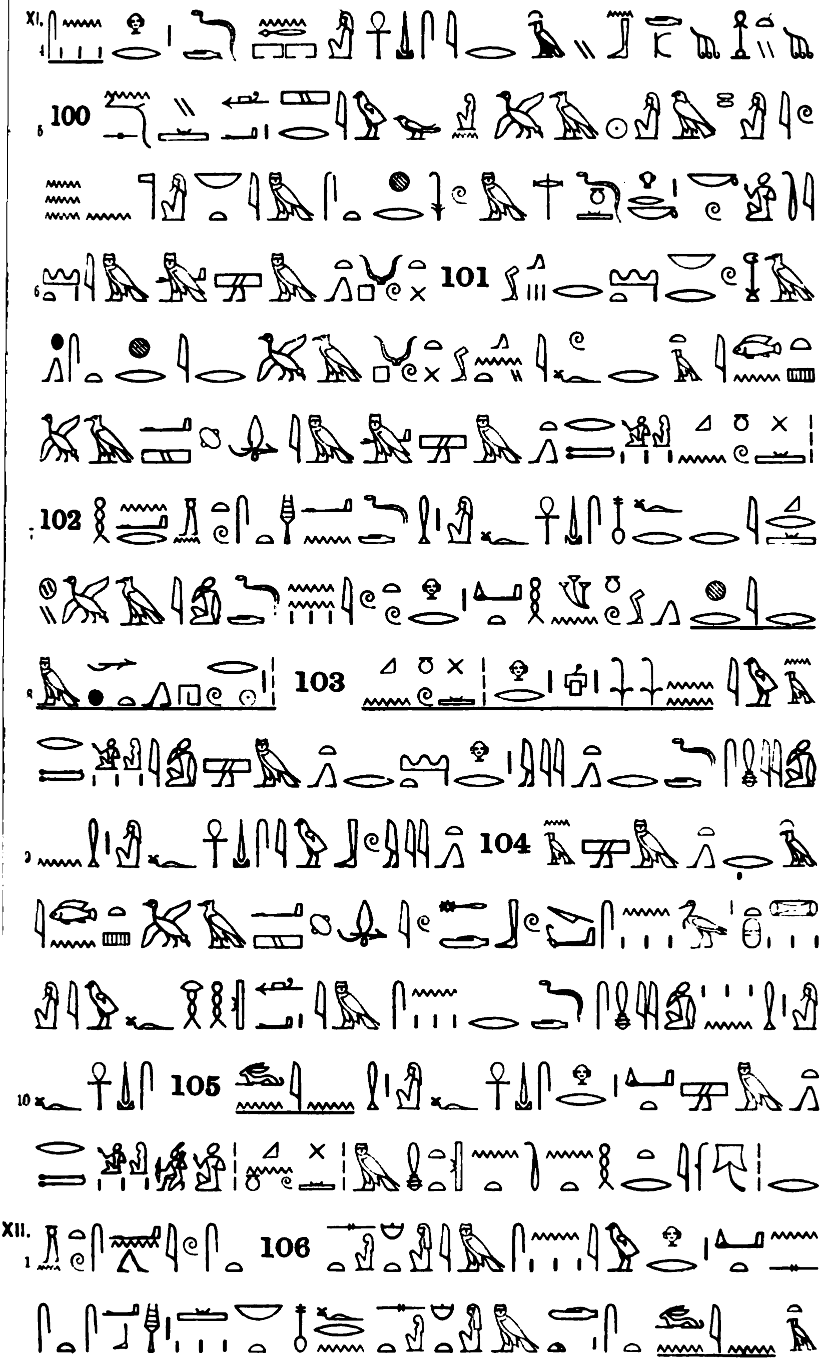
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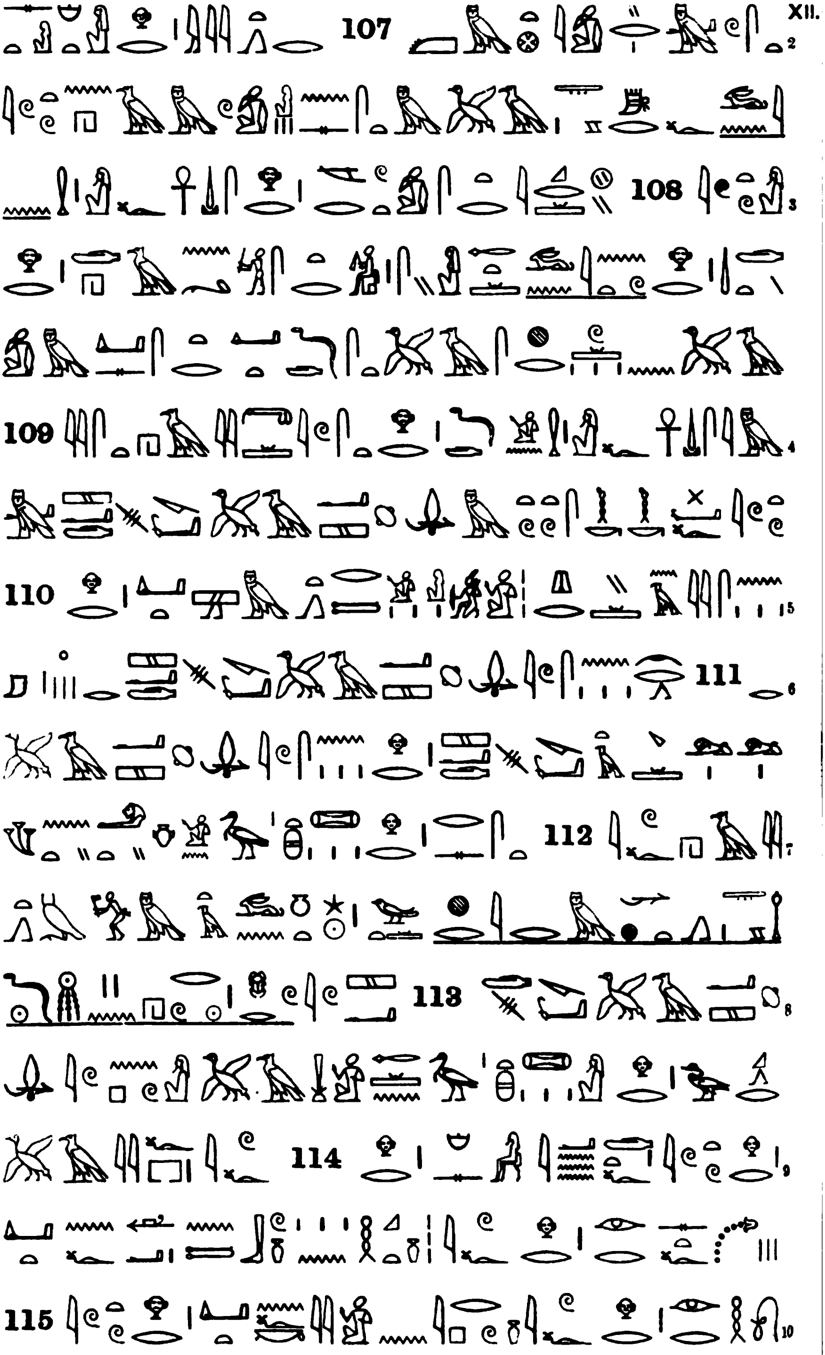
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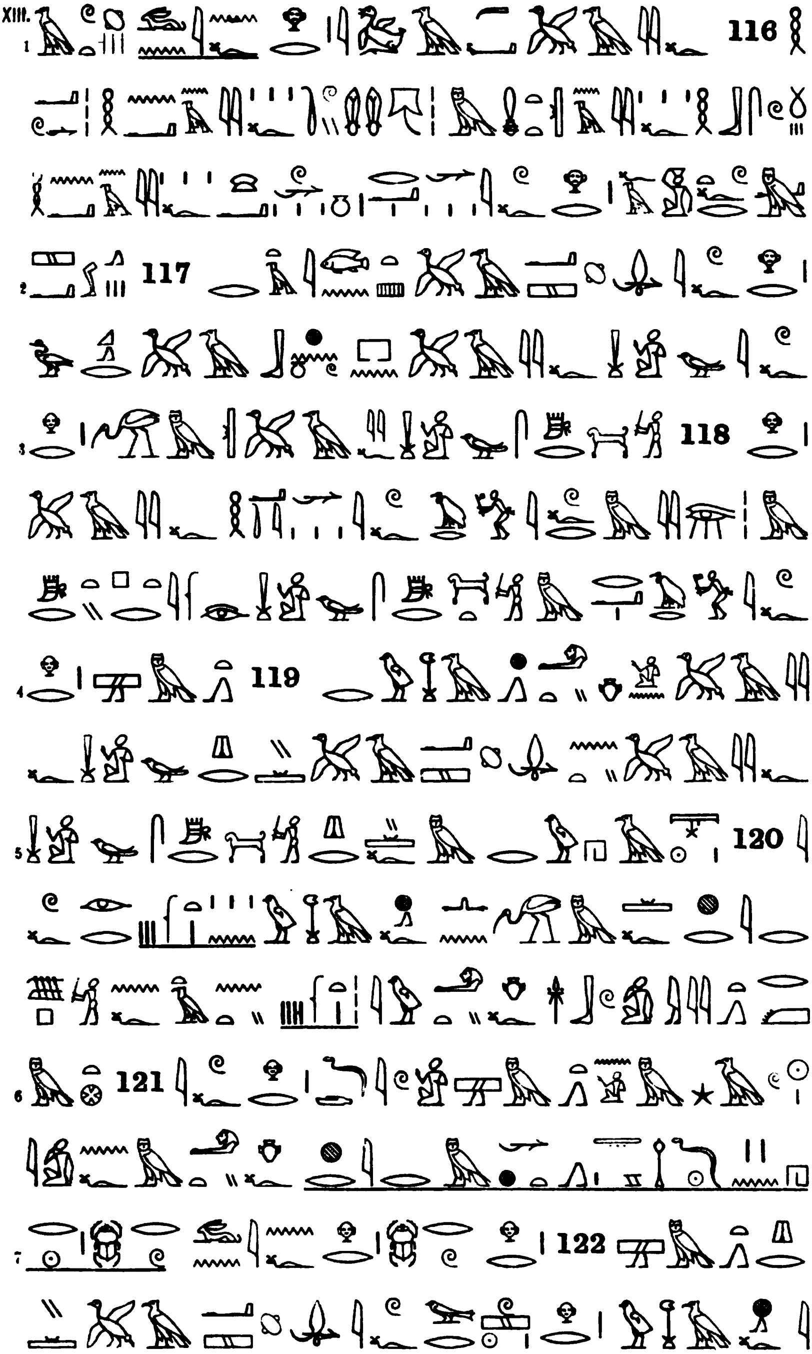
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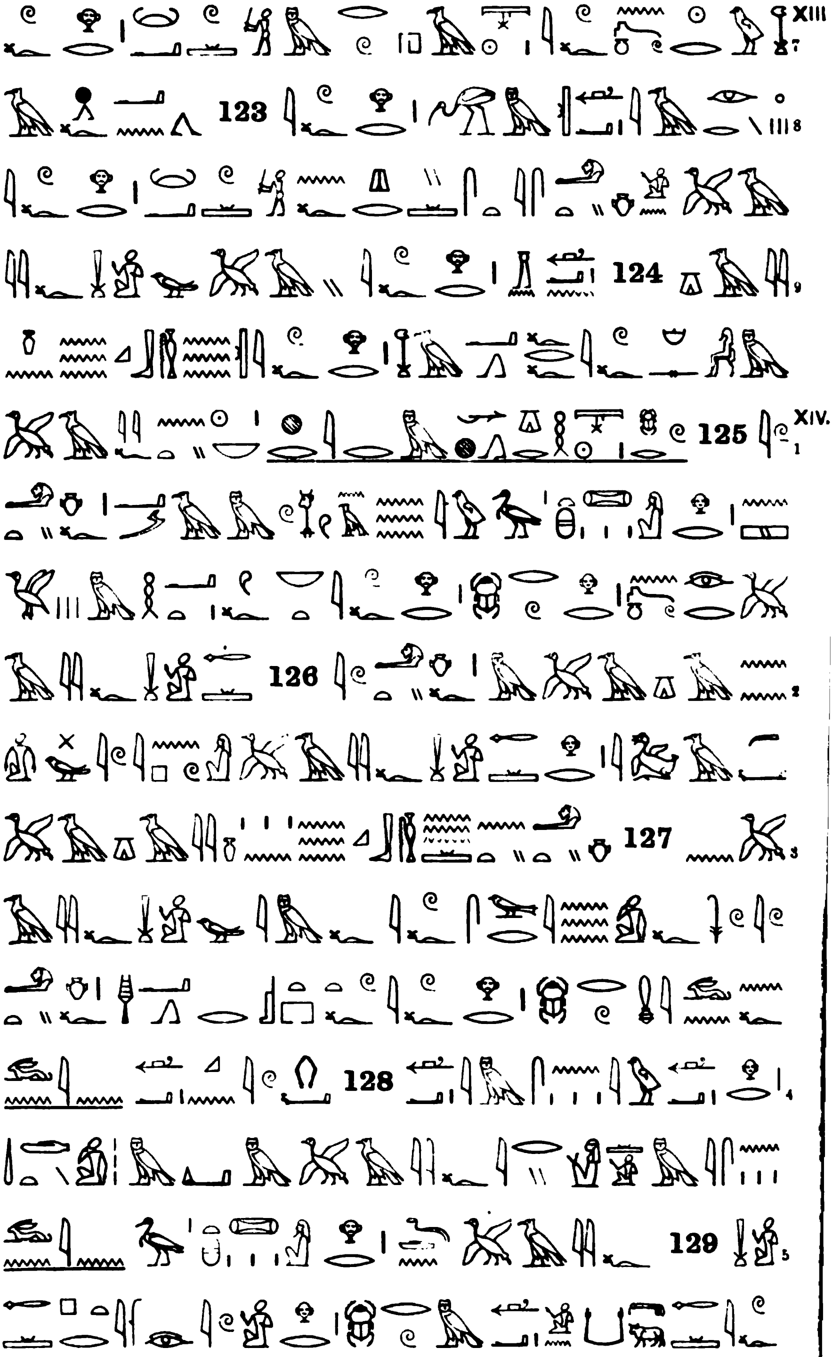
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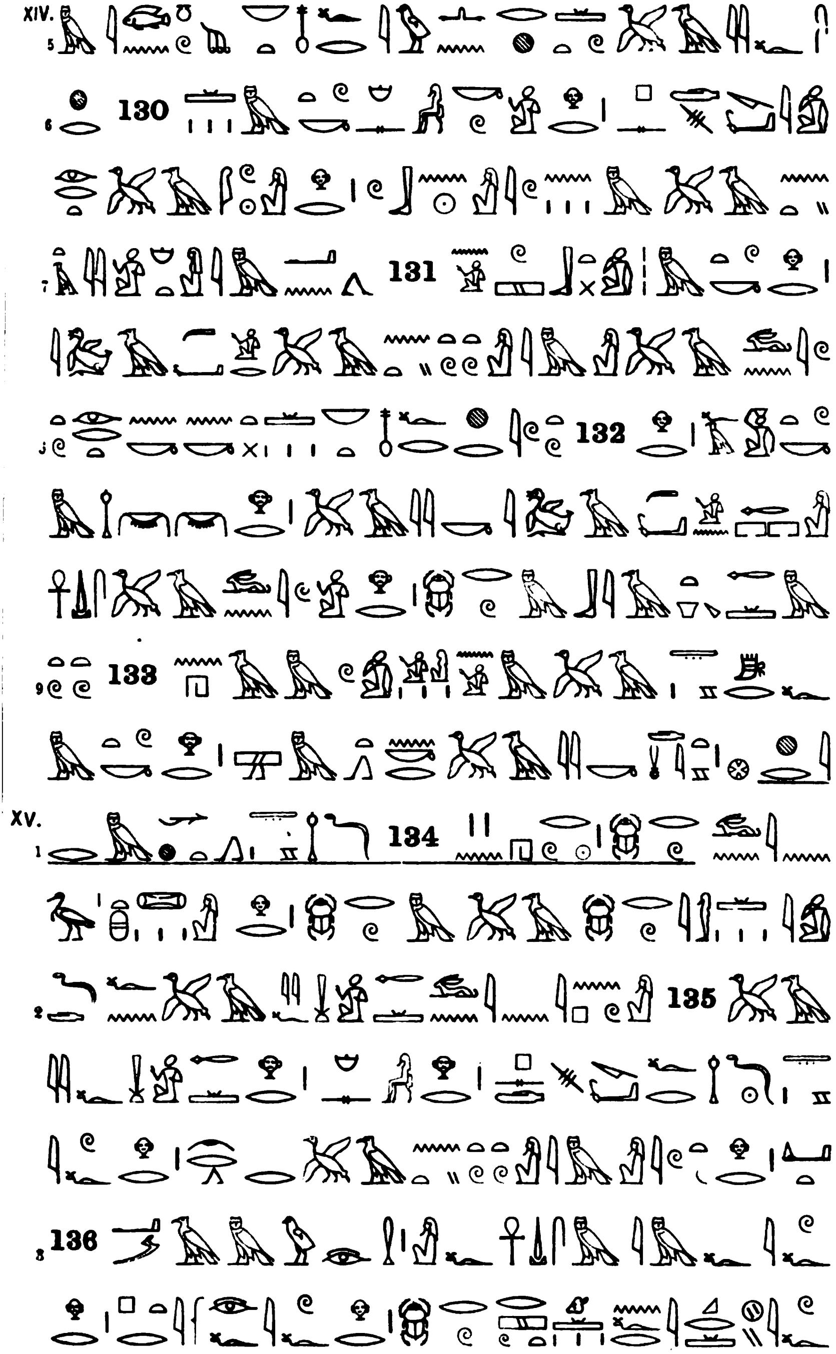
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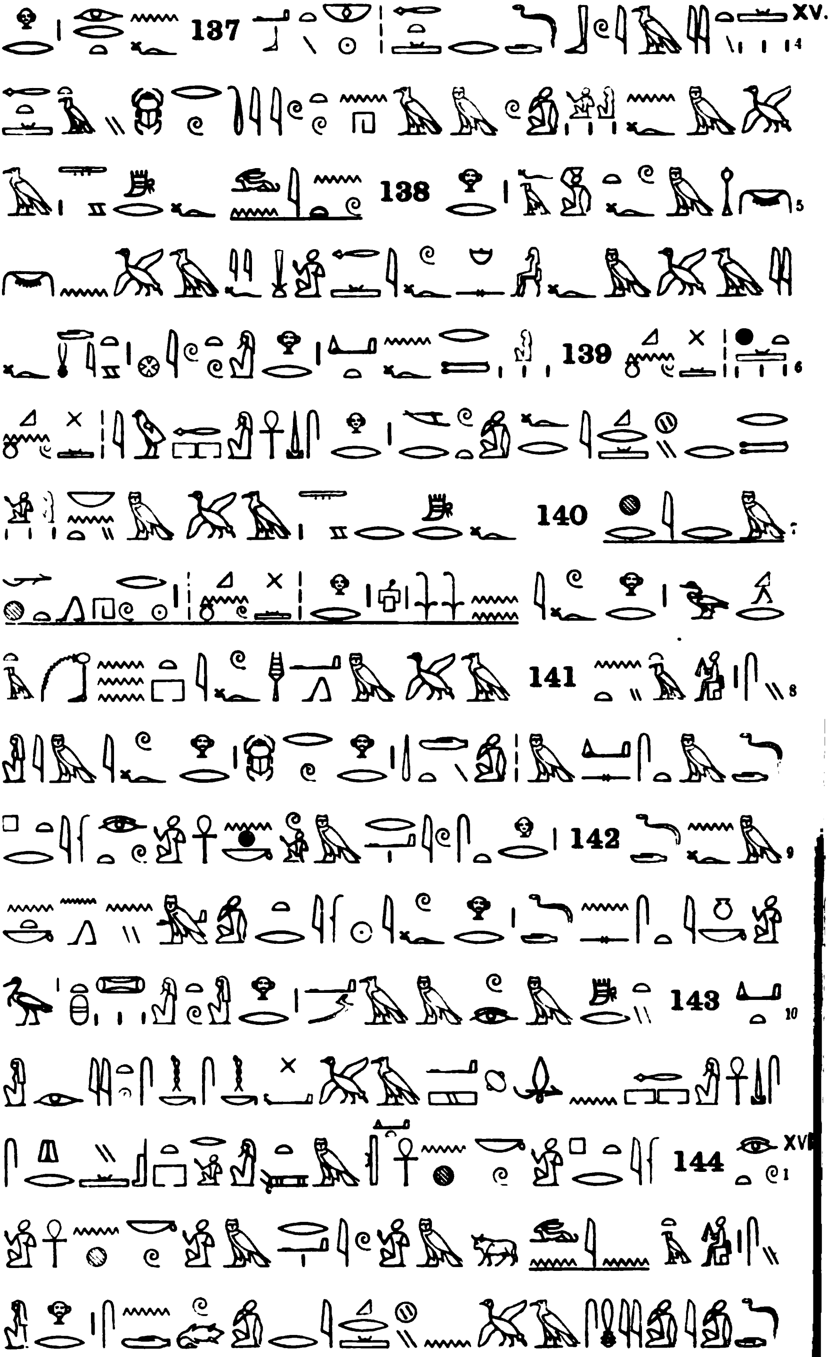
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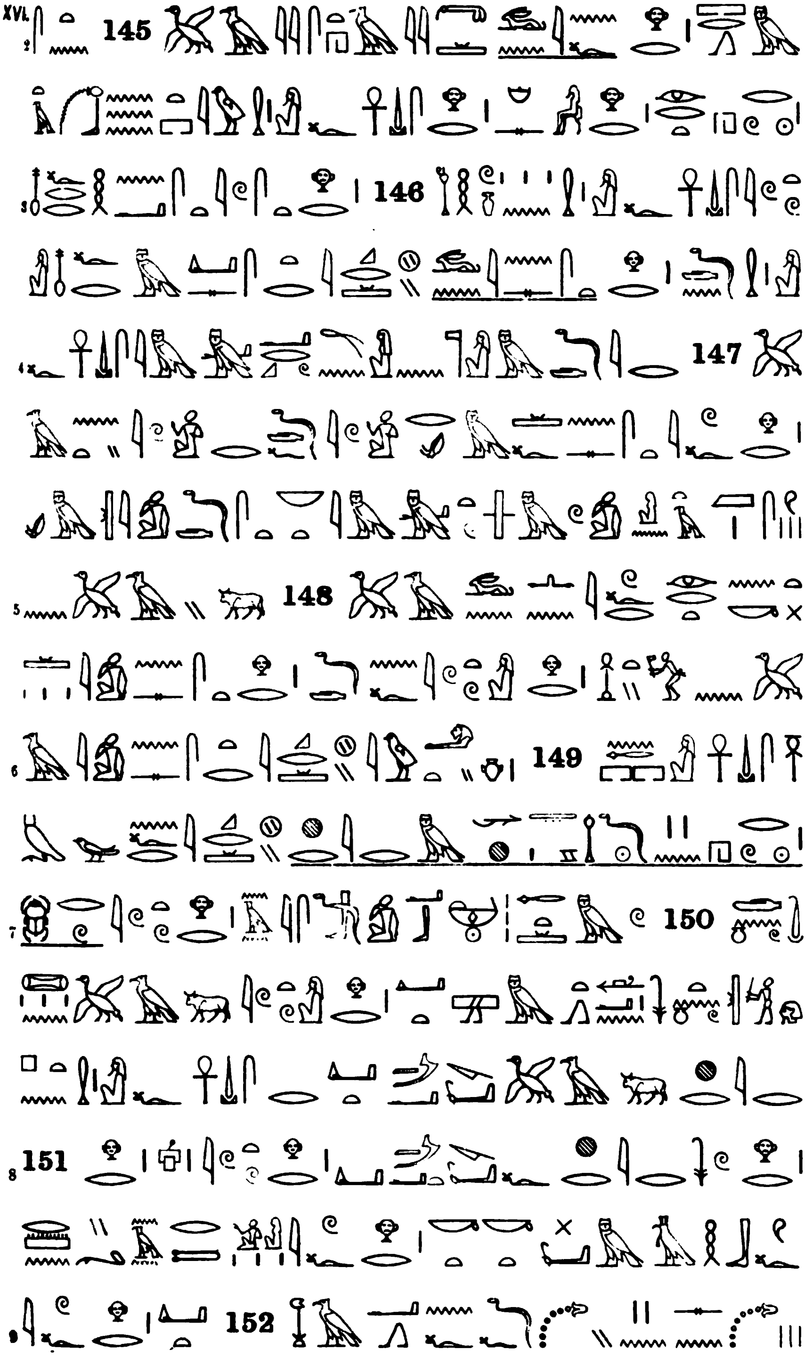
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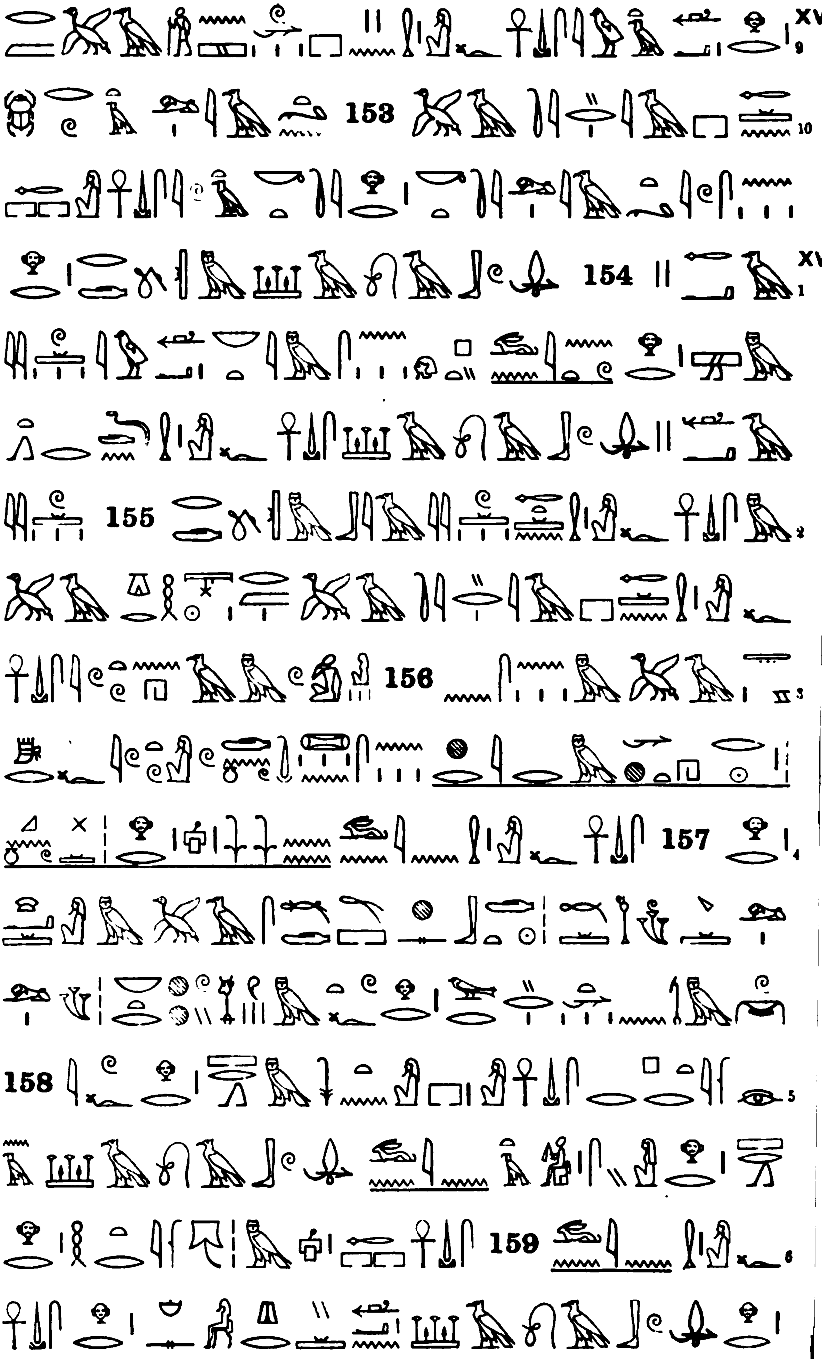
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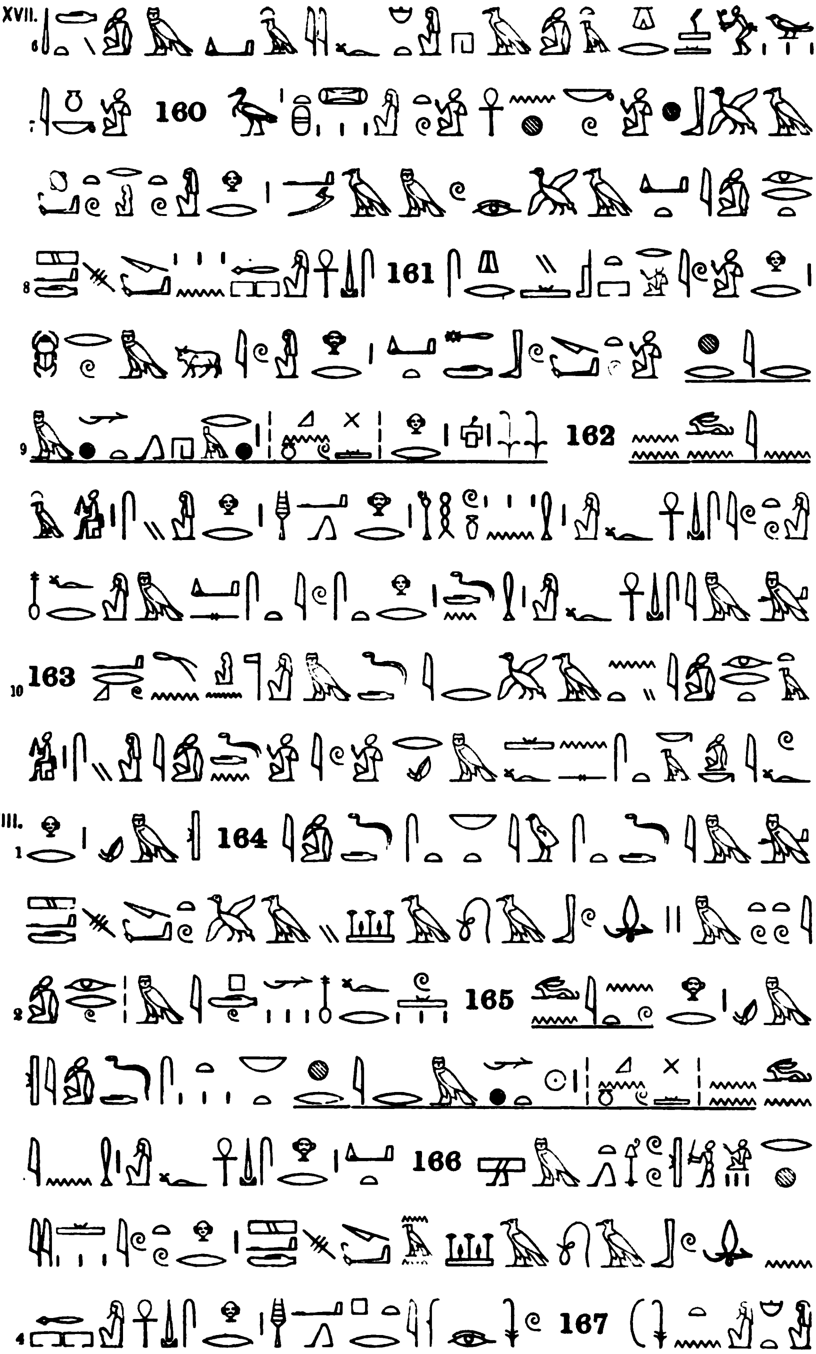
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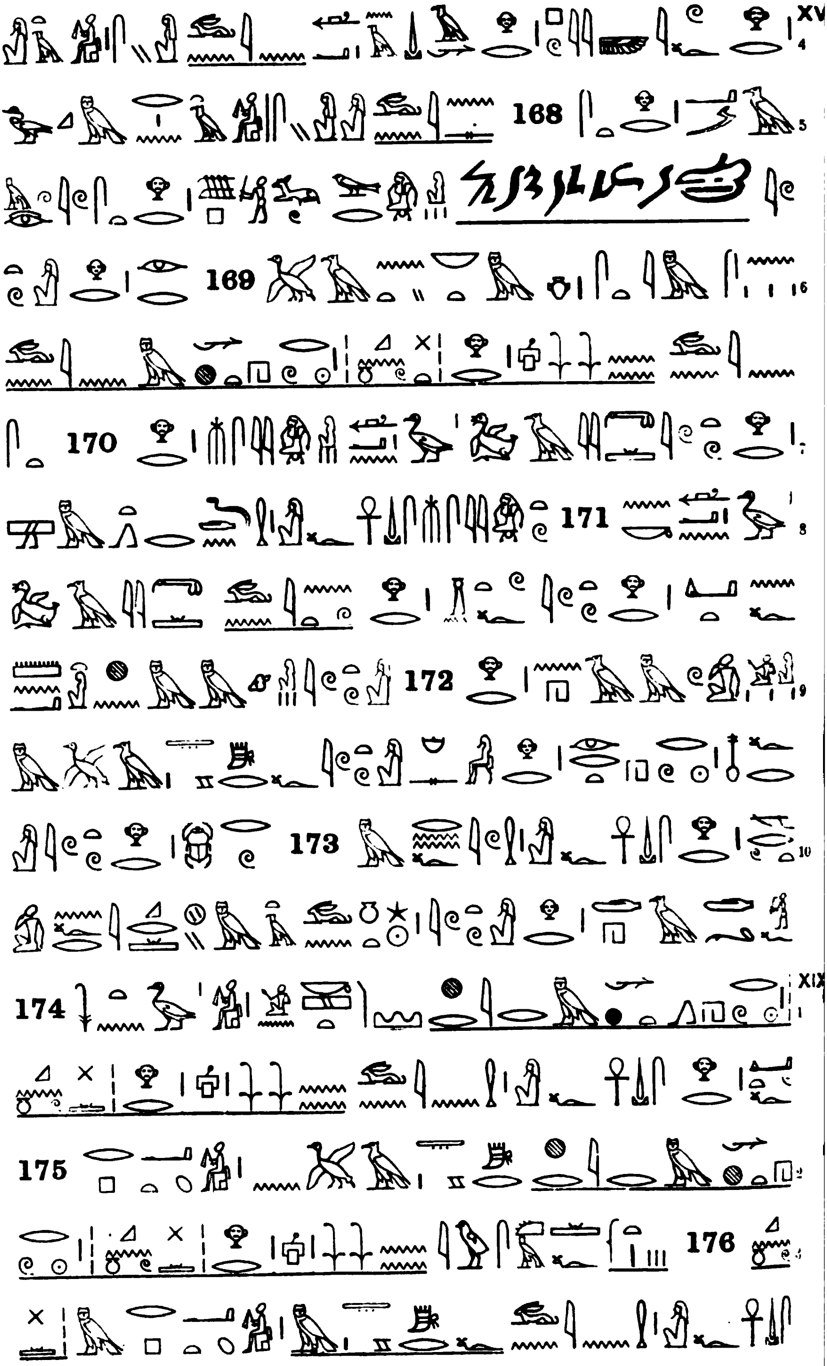
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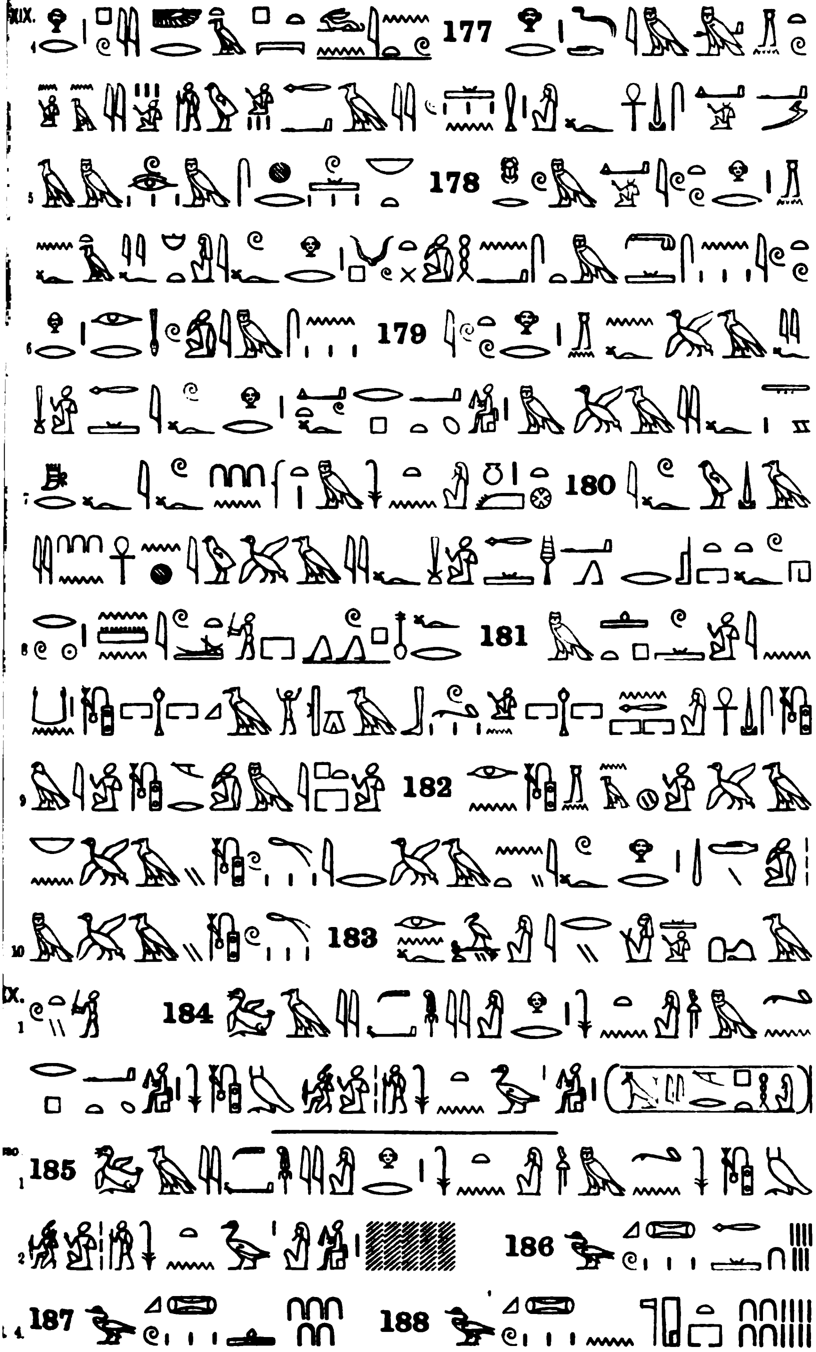
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TRANSLATION.

Once upon a time there were two brothers of the same mother and father. Anubis was the name of the elder and Batau that of the younger. Now Anubis was married and had a house **2** while his younger brother was his servant. He attended to the clothes, and followed the cattle on the pasture, **3** and did the ploughing and the threshing; in fact he did everything connected with the farm. He was, indeed, **4** an excellent workman, and none could be found like him in the whole country. He was, besides, a good brother.

Now for a long time this younger brother **5** was tending the cattle according to his daily wont, returning home every evening, having on his back **6** the herbs of the field that he had gathered while on the pasture, and setting them down before his older brother who passed the time with **7** his wife in eating and drinking. Then he lay down to sleep in the stable with his cattle **8** as usual. *The next day* he would bake loaves of bread on the fire and place them before his older brother **9** and take some loaves to the field. Here he tended his cattle, pasturing them and walking behind them. But **10** they would tell him where there were good herbs growing, and he would listen to all they told him and drive them where **11** they could find the good herbs they loved so much. His cattle, consequently, thrived under his hands and their young multiplied **12** greatly.

Now when the time of ploughing arrived the older brother said to him: "Come, let us take our yoke of oxen and get ready **13** for ploughing: for the soil is beginning to appear (after the inundation) and is now in excellent condition for ploughing. Do you, therefore, go to **14** the field with seed. To-morrow we will begin to plough." Thus he said, *and* his **15** younger brother made all the arrangements with which his older brother had charged him.

On the following **16** *day* they went out on the field with their yoke of oxen and began to plough. They were quite **17** cheerful at their work and not idle for a moment. *Now after a few days* **18** they were again at work in the field *when* the older brother came to the **19** younger and said:

"Run and fetch us some seed from the town!" Then he went and found the wife **20** of his older brother sitting in the house and arranging her hair *and* said to her: "Come, give me some seed, **21** that I may take it to the field; for my older brother has sent me saying: 'Run, and don't be long about it!'" *But she* answered him: "Oh, go yourself! **22** open the bin and take as much as you need. I am afraid, lest my tresses fall to the ground." *So* the young man **23** went to the stable and took a big basket, which he filled with as much seed as he needed and put on his shoulder **24** full of barley and spelt. But when he came back with it, his brother's wife asked him: "How much have you on your shoulder?" *He* answered: "Of spelt I have **25** *three* bushels and of barley two, making in all *five* bushels that I have on my shoulder." That was all he said. *But she* replied: "You are, indeed, **26** very strong. I have for some time already been admiring your strength." And her heart grew desirous, for she knew his strength.

Then she **27** arose, being passionately enamored of him, and said: "Come, let us enjoy an hour of intercourse, and I will do many favors for you and will surely make **28** you two beautiful garments." *But* the young man became like a southern panther and flew into a towering rage, because of her solicitation **29** to such a sin that she asked him to to commit. When, therefore, she became very much afraid, *he* said to her: "Are you **30** not as a mother to me and your husband as a father? Is he not older than myself and supporting me? Oh, **31** what terrible sin is that which you want me to commit! Don't ask me again! As for me, I will not divulge it to a living soul, nor shall any mention of this matter issue from my lips to any one." **32** Thereupon he went to the field, *and when he* arrived where his older brother was, they kept on **33** in their work.

In the evening, however, the older brother went **34** home, while his younger brother walked behind his cattle, bearing on his back all the produce of the field and driving his cattle **35** before him to let them rest in the stable which was in the town. But the wife of the older brother was afraid **36** that his younger brother had told him all that she had said; *so she* besmeared herself with grease and dirt and gave herself the appearance of one who had been ravished.

for she intended **37** to say to her husband: "Your younger brother has done me violence." Now when her husband returned in the evening **38** as usual and came to his house, he found his wife lying on the floor like one who had been outraged by some villain. She did **39** not fetch him water for his hands, as she always did, nor did she light the lamp for him; but his house was in darkness, and she was lying **40** besmeared on the floor. Then he asked her: "Who has had intercourse with you?" She answered: "Who else but your **41** younger brother, when he came to get some seed for you and found me alone. It was then he said to me: 'Come, let us enjoy an hour of intercourse! **42** Put on your new dress!' So said he to me. But I did not listen to him, and answered: 'Am I not as a mother, and is not your older brother as a father to you?' **43** This is what I answered him. He, however, became alarmed and assaulted me, so that I might not disclose this to you. Now, if you let him live, then I must die; for **44** he will come to beat me, because I have betrayed to you his wicked words. He will surely do so."

Then the older brother became **45** like a southern panther and whetted his knife, and took it in his hand. *Then* he hid behind the door **46** of the stable, in order to kill his younger brother, when he should return in the evening and drive his cattle into the **47** stable. Now when the sun had set, the younger brother loaded himself with all the herbs of the field, as was his daily custom; but when he **48** came home, and the leading cow was about to enter the stable, she cried out to her driver: "Take care, for your older brother is standing in **49** front of you with his knife, to kill you. Step aside and flee from him!" *Then he* listened to what his leading cow had said. When **50** the next cow was about to enter the stable, she said the same thing. So he looked under the door of the stable **51** and saw the feet of his older brother, who stood behind the door with the knife in his hand. **52** Then he dropped his load and ran away. But his **53** older brother pursued after him with his knife. *Then* the younger brother invoked the sun-god Râ-Hor-khuti, **54** praying: "Oh, my Lord and gracious God, be thou the judge here between the guilty and the innocent!" Then Râ **55** heard his prayer and caused a big river to flow between him and his older brother. This was **56** full of crocodiles. Each of the brothers was, therefore, on a different side of the river. Then **57** the older brother threw (a stone) twice at the younger without hurting him, however. But as he did this *there* **58** called out to him the latter from the other side, saying: "Lo! on the morrow, when the sun is risen, I **59** will explain everything to you and will give you the true facts: but I can not be a son to you any longer, **60** neither will I stay in the same place with you. I shall start for the acacia-hill."

On the following day, when **61** Râ-Hor-khuti had risen, the two brothers met again. *Then* the younger addressed the older brother, saying: **62** "Why do you pursue me, and why do you wish to kill me without cause? You have not heard me say such words as I am accused of, for I am truly your younger brother. Indeed, **63** you have been as a father to me, and your wife as a mother. Now listen, when your wife told me to get the seed for us **64** she said to me: 'Come, let us enjoy an hour of intercourse!' Alas! see how she has perverted the truth to you." *Then he* **65** revealed to him everything that had passed between himself and his brother's wife *and* swore by Râ-Hor-khuti, saying: "What did **66** you mean by acting so wickedly and trying to kill me, when you were standing behind the door with your knife? Fie upon such treachery!" Then he took a **67** sharp knife and maimed himself, casting the flesh into the water as food for the fish. Then **68** he became very weak and faint.

But his older brother took it very much to heart and wept violently; still he could not cross over to his younger brother on account of the crocodiles. **69** *Then* the latter called out to him, saying: "Behold, you imagined an evil thing of me and were ignorant of the good service I had done you. Come now, go home and **70** tend your cattle; for I will not remain with you, but will go to the acacia-hill, because you came to harm me. **71** Learn, however, what will happen to me in the transformation of my heart, which I will place in the highest blossom of the acacia. When the tree is cut down the heart will fall to the ground, **72** and you will come to look for it. But when *seven years of* your quest are ended, be not discouraged, for you will then find it. Put it into a jar of clear water, and I will revive again and give

73 you further instructions. You will then learn everything from me. Then take a jug of beer in your hand; as soon as it begins to ferment, haste away!" *Saying this* he departed **74** for the acacia-hill. But his older brother went home, putting his hands to his head and strewing it with dust. When he arrived home he put to death **75** his wife and cast her body before the dogs. Then he sat down and wept for his younger brother.

Now for a long time the younger brother lived on the acacia-hill **76** with no one to keep him company. He passed his time with hunting the beasts of the country and resting during the night under the acacia, in whose highest blossom his heart lay. *After* **77** *a while* he built for himself a house with his own hand on the acacia-hill **78** and fitted it out with all the good things he wanted. But one day he walked forth from his house, when he chanced to meet the circle of the gods **79** as they walked about, deliberating concerning the affairs of their land. *Then* the circle of the gods addressed him with one accord, saying: **80** "Oh Batau, hero of the circle of the gods, you are here all alone, having left your village on account of the wife of Anubis, your older **81** brother. Know that he has killed her after you reported to him all her false statements against you." Then they pitied **82** him, and Râ-Hor-khuti said to Khnum: "Do you fashion a wife for Batau that he may not **83** be alone." *Then* Khnum made him a companion to be with him, more beautiful than any woman **84** in all the land. The whole godhead was in her. *But* the seven Hathors came to view her and said with one accord: **85** "Oh, she will surely cause Batau's death." *But* the latter loved her very much. She remained in the house while he was occupied with **86** hunting the beasts of the country, which he placed before her. But he cautioned her, saying: "Do not go far from the house, lest the river **87** seize upon you; for I am too weak to rescue you from it, because I am a woman like yourself and my heart is in the highest **88** blossom of the acacia. If any man were to find it I would fight for it." *Then* he told her all the circumstances of his life.

89 *Now after some time* Batau went out to hunt, as he was accustomed to do daily, **90** when the young woman began to promenade under the acacia near the house. Lo, the river descried her, **91** and the water dashed up to follow her. But she ran away from it and entered the house. *Then* the **92** river called to the acacia, saying: "Oh, how I love her!" So the acacia gave it a lock of her hair, *which* the **93** river carried to Egypt and deposited where the washermen of the reigning Pharaoh were. *Then* the odor **94** of the lock of hair pervaded the clothes of Pharaoh, so that there arose a dispute among the washermen **95** on account of the odor. They quarreled amongst themselves daily without **96** knowing the reason. Then their overseer went to the river's edge, while his mind was perplexed **97** sorely because of this daily contention. *Here* he stood directly opposite the lock of hair, **98** which was in the water, and ordered one of his men to fetch it. When it was brought, he found that it had a most delicious odor: so he took it to Pharaoh.

99 *Then there* were brought the scribes and wise men of Pharaoh, who said to him: "This lock of hair **100** belongs to a daughter of Râ-Hor-khuti, and in her is all the essence of the godhead. Now since you rule over the foreign countries, despatch messengers **101** to them to look for her; but let the messenger who shall go to the acacia-hill take many people **102** along to fetch her." To this his majesty replied: "What you say is very good." Thereupon he dismissed them.

Now many days **103** *after this* the messengers who had gone to the foreign countries returned and delivered their message to his majesty. None, however, returned **104** of those who had been sent to the acacia-hill, for Batau had killed them, sparing but one to carry the news to his majesty. **105** But the latter again sent many people with infantry and cavalry to fetch her; and they took along **106** a woman who had all sorts of nice trinkets that women fancy. *Then* Batau's wife accompanied her to Egypt. **107** But the whole country rejoiced on her account, *and* his majesty loved her passionately, **108** and raised her to the dignity of a legitimate wife. *Then* she told him everything about the condition of her **109** husband, saying to his majesty: "Only have the acacia cut down, and he will surely die." So the king **110** despatched men and soldiers with axes to cut down the acacia. When these arrived at the place **111** they cut down the acacia together with the blossom, in which the heart of Batau was lying. **112** But he fell down dead instantly.

But on the following day after **113** the acacia had been cut down Anubis, Batau's older brother, entered his house and **114** sat down to wash his hands. When he took a jug of beer, however, it turned to froth. **115** Another jug of wine, which he then took, fermented likewise. *Thereupon he* took his **116** spear and his sandals, and put on his back his garments and implements of work, and started **117** for the acacia-hill. When he arrived there he entered the house of his younger brother and found him stretched out **118** on the bench dead. Then he wept, when he saw him there so still in death, and went out **119** to search under the acacia for his younger brother's heart; for under it did he lie down to sleep at night. **120** *Three years of* search for it were fruitless; but when the next *four years* had passed, Batau's heart would fain have gone to Egypt, **121** and said: "To-morrow I shall start." So said his heart.

On the following day it happened that the older brother was **122** walking under the acacia, occupied with searching for the heart. In the evening he again resumed his search. **123** Then he found a pod of the acacia, and took from it the heart of his younger brother; for, lo, it was there. Thereupon he took a **124** jug of clear water, casting the heart into it, and remained in the house all day. *But when it was evening* **125** Batau's heart absorbed the water, while his body was still lying motionless; for when he beheld his older brother **126** he swooned. But Anubis, the older brother, took the jug of clear water, in which the heart **127** of his younger brother lay, and washed it in the water. Then the heart revived and Batau became his former self. *After* they had embraced **128** the one spoke to the other.

Then Batau said to his **129** older brother: "Behold, I shall be transformed into an Apis-bull, which has all the required markings and whose origin is mysterious. **130** Do you take your seat on my back. Oh, do this; for when the sun-god Shu shines we will arrive where my wife now is. Furthermore, **131** I beg you to take me to the king, who will give you many presents and **132** will bestow on you silver and gold, because you have brought me to Pharaoh. But I shall be considered a great prodigy, and there will be

133 joy on my account in all the land. You, however, return to your village."

On the following **134** *day* Batau became transformed, as he had told Anubis, his older brother, **135** who mounted on his back. At day-break they arrived where the king was. Then it was **136** announced to his majesty who, when he saw the bull, rejoiced exceedingly and offered up to it **137** sacrifices in great number, saying: "A great miracle has been wrought; let there be joy in all the land." *But the king* **138** gave silver and gold to the older brother, who thereupon returned to his village. Then there were provided for the bull many **139** servants and many dainties, because Pharaoh and all the people in the whole land had become exceedingly fond of it. **140** *Some time after this* the bull went into the harem and stood in front of the **141** queen, and addressed her, saying: "Behold, I am still alive!" But she **142** asked him: "Who are you?" He answered her: "I am Batau. You knew that when **143** you caused the acacia to be cut down by Poaraoh, that then I would die. But see, **144** I am still alive. I am this bull." *Then* the queen became exceedingly alarmed at the words of **145** her husband. *The bull, however,* departed from the harem.

But one day his majesty was enjoying the society of his wife who was **146** with him at the table, when he became so fond of her, *that she* begged him: "Oh, swear to me by the deity and say to **147** whatever I may ask: 'I will do it for you.'" But he listened graciously to all that she said. "Then I want to eat the liver of this bull, **148** which is of no use to you at all." That was what she said to him. But the king was very much grieved at her words and his heart **149** was exceedingly troubled. *On the following day, however,* after he had offered up large sacrifices in **150** honor of the bull, he despatched his chief of the butchers to kill the bull. But **151** while they were killing it, it stood by the side of the men and lowered its neck for the death blow. Then there **152** oozed from the wound two drops of blood which fell by the side of the two large doors of Pharaoh's house. One was on the one side of **153** the grand staircase of Pharaoh, while the other was on the other side. They were transformed into two large **154** perseas, each of magnificent growth. Then the people came and told his majesty:

"Two large perseas **155** have sprouted out of the ground during the night as a great and good sign for Pharaoh. They are by the side of the royal staircase." But the people rejoiced **156** because of them in all the land, and the king offered up sacrifices to them.

Some time after this his majesty **157** appeared in state in the coronation-hall of lapis lazuli, wearing around his neck a wreath composed of all kinds of flowers, and standing on a chariot of gold-metal. **158** He issued from his royal palace to view the perseas. *But* the queen came also on a chariot behind Pharaoh. **159** *Now while* his majesty sat beneath one of the perseas, [she sat beneath the other. Then Batau] addressed his wife: "Oh, you wicked one! I **160** am Batau. I am still alive to your mortification. You imagined that you could have me killed by Pharaoh **161** even here; for when I became transformed into a bull you ordered me to be killed."

Now some days after this **162** *it happened that* the queen was sitting at the table with his majesty, who was very affectionate to her, when she said to him: "Come, **163** swear to me by the deity and say: 'Whatsoever the queen asks me to do, that I will certainly do for her.'" But he listened graciously **164** to all that she said. "Then," she replied, "let the two perseas be cut down, and have good planks made of them." **165** *Then the king* acceded to her wish. *A few days later* his majesty **166** summoned skillful workmen, who cut down the perseas at his command. But there stood by and looked on **167** the royal wife and queen. *And* a splinter flew off and entered the queen's mouth. *Then she* **168** felt that she had conceived. (*But she was happy*) because she now had **169** all that she desired.

Some time after this she **170** gave birth to a male child, and the people came to tell his majesty: "There has been born **171** to you a male child." *But the king* gave the child nurses and waiting-women, and the people **172** rejoiced in all the land. The king celebrated a holiday and gave the **173** child a name. His majesty loved him so much from this time, that he made him **174** a prince of Nubia. *Soon thereafter* his majesty made him **175** governor over the entire country. *After he had been for many* **176** *years* governor *over the entire country* his majesty flew up to heaven.

Then (*Batau*) **177** said: "Let there be brought to me the great chiefs of his majesty, and I will explain all the matters **178** relating to my transformation." After that, when his wife had been brought, he laid his charges against her before the chiefs, who judged between them. **179** Then there was brought to him his older brother, and he made him governor over the entire land. But he remained king of Egypt for thirty years. **180** Then he departed this life and met his older brother on the day when he cast anchor in heaven.

* * *

The story is finished to the entire **181** satisfaction of the scribe of the treasury Qagabu, of the royal treasury, and of the scribe Hora, and of the scribe Meremapt. **182** It was copied by the scribe Annana, the head librarian. Now, whatever (good or bad) any one may say of this story, **183** may Thoth either bless or curse him.

* * *

184 [The owner of this papyrus is] the fan-bearer at the king's right hand, the governor, the royal scribe, the commander of the infantry, the oldest prince, Setimerptah.

* * *

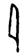
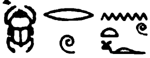
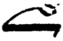
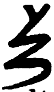
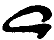
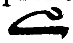
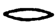
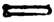
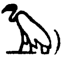
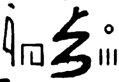
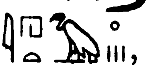
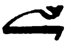
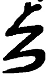
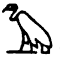
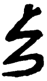
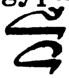
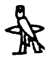
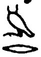
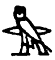
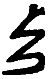
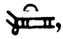
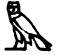
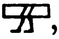
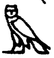
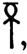
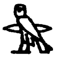
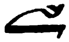
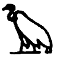
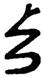
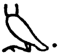
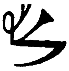
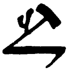
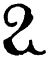
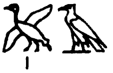
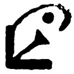
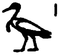
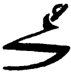
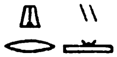
185 The fan-bearer at the king's right hand, the royal scribe, the commander of the infantry, the oldest prince, (Setimerptah).

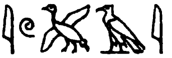
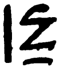
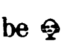
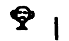
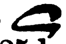
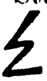
* * *

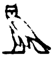
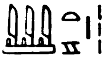
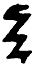
186 Large loaves of bread	17.
187 Hetep loaves	50.
188 Temple loaves	48.

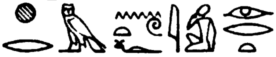
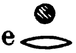
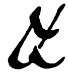
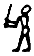
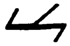
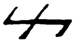
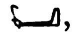
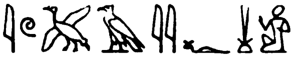
NOTES

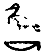
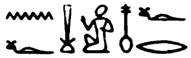
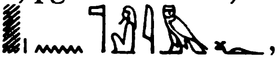
ON THE HIERATIC TEXT AND THE HIEROGLYPHIC TRANSCRIPTION.

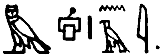
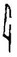
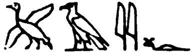
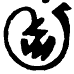
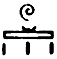
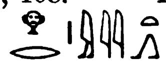
Line 1. The first Hieratic signs of the papyrus are all plainly legible except the first letter , which is supplied from Pap. Harris 500 Verso pg. 4, l. 1; which see. The other reading  is altogether inadmissible. —  and .– The transcription of these signs presents some difficulty though their pronunciation **mer** is established. The sign  below the  in this line must be  (cf. l. 42 and 63), although the original shows a distinct  in l. 30. The upper sign occurs also in other words in this papyrus; thus in l. 85 (**mer** "*to kill*") and l. 118, a variant of the preceding. The Hieroglyphic word for "*mother*" was always written with the sign of the vulture (). But at the same time we find in Papyrus Bûlâk XVII, line 56, a word written , **âḥem**, which corresponds to the Ptolemaic , **âḥemt**. From this we should infer that both  and  ought to be transcribed by . But in line 85 of our papyrus these two Hieratic signs appear side by side in two words having the same meaning. The question now arises: are both signs only different forms of the Hieroglyphic vulture? and, if this is the case, why does our scribe employ two different forms in the same line? Prof. Pleyte, in his "Catalogue raisonné de types égyptiens hiératiques" (Leide 1865), transcribes the  by  in the word for "*chief, overseer,*" **mer**, where the Hieroglyphic has a  or . It looks very much as if the first form had grown out of the second to facilitate writing. But in many cases in our papyrus we can not substitute a  for ; for instance in lines 39, 42, 57, and 86 (in the case of , **tem**, whose complement is  according to lines 43 and 82); in lines 73 and 96 (in the case of , **s̱hem**, which is also followed by an  only); and perhaps also in lines 38, 81, and 149 (in the case of , **sek̲h̲mer**, which could, however, also have a  as complement). Taking all this into account, it will be best to transcribe  by  and  by . —  is a ligature consisting of the signs  and . It is thus written separately in Papyrus Harris 500 Verso pg. 4 l. 2, 4, 6, 8, 9, &c.; also very plainly in Papyrus Abbott pg. 1 l. 6. The Hieroglyphic is , **pa**. —  is a ligature for the Hieroglyphic , **ba**. Without this small line the Hieratic figure is . — The C in the name of Batau is the Hieroglyphic ⌓, **t**. It is frequently written ∩ (cf. l. 2, 88, 89, 122, 133 and 180), and simply ◆ (cf. l. 22, 73, 84, 91, 104, 125, and 142: in l. 50, 77, 115, and 143 it resembles a small line). — The missing signs of , **k̲h̲eri**, occurring twice in this line, are supplied from l. 14, 16, &c.

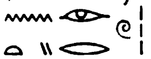
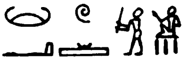
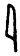
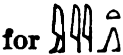
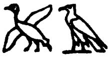
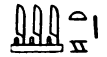
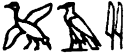
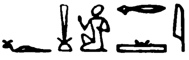
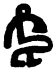
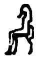
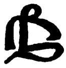
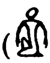
Line 2. : supplied from the context; cf. l. 12 and 19. — . The Hieroglyphic equivalent for this would be , **ḥer**, but the exact transcription is . The horizontal line below the first sign is an ⬭, which is sometimes written in full as  (cf. l. 40 and 100 of our papyrus and Pap. Berlin 1425 l. 23, 44, 51, 56, 59, 64; Pap. Bûlâk XVII l. 8, 9, 31) or else abbreviated into a ◆ (cf. Pap. Berlin 1425 l. 35; Pap. Bûlâk XVII l. 16). With reference to the vertical line after this sign, see Lemm, "Studien zum Ritualbuche des Ammondienstes" pg. 15. —  is a ligature for , **ụt** (cf. l. 5, 34, 46, 76, 86, 107, 115, 136, 173, 180).

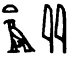
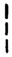
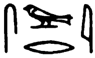
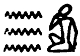
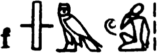
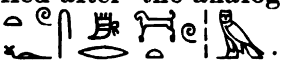
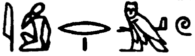
— The  before  is supplied from l. 3. —  is a ligature for or the usual Hieroglyphic .

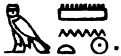
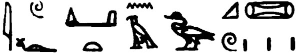
Line 3. . Traces of the  can still be seen in the original. The other missing signs are supplied from l. 2. — We always transcribe the determinative  by  and  or  by , although the latter is the more usual equivalent for both Hieratic forms. — . The missing signs are supplied from the context.

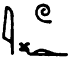
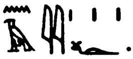
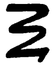
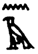
Line 4.  is supplied from l. 33. —  is only a conjecture. Griffith, in the "Proceedings of the Society of Biblical Archæology," 1889, pg. 163 and 164, thinks he can distinguish in the original , and translates: "Behold the [essence? strength?] of a god was in him." — The other missing signs are supplied from the context.

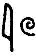
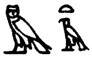
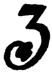
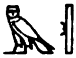
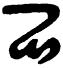
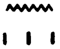
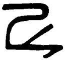
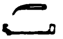
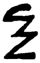
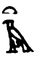
Line 5. . Supplied from l. 2, 9, 34. — The  in the first  either was omitted by the scribe or else it is worn away on the papyrus. —  is a ligature for ; cf. l. 30. The signs are written separately in l. 2, 38, 39, 42, 47, 63, 79, 89, 108. — The ⊙ is supplied from l. 38, 47, 89, 124. —  is supplied from the context; cf. l. 13, 106, 120.

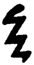
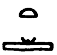
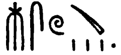
Line 6. . The signs are distinctly visible although some portions of them are worn away; cf. l. 164 and Pap. Bûlâk XVII 1.72. —  is supplied from the context; cf l. 33, 37, 122, 123. Into this place a fragment of the papyrus has been incorrectly fitted. It should have been moved up one line, and then furnishes one  for  in l. 5 and the  before  in l. 6. —   is supplied from the context and portions of the Hieratic signs still legible. — There is only a slight difference between  () and  (), the former being the determinative after words denoting "sitting, resting" (cf. l. 20, 41, 75, 83, 85, 114, 124, 130, 135, 138, 145, 159, 172), while the latter is the determinative after words denoting "weakness, illness" (cf. l. 68, 126).

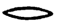
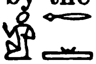
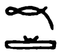
Line 7. . From the context. — The  after   is supplied after the analogy of  in this same line. — . A conjectural reading. —  is supplied from l. 107.

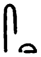
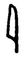
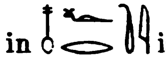
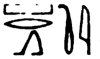
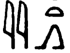
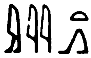
Line 8. . From the context and l. 26, 95, 97. — . A conjectural reading.

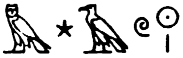
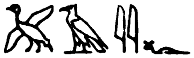
Line 9.  and . From the context. —  is a ligature for , otherwise written in the usual way.

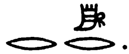
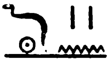
Line 10. . From the context. — . From the context; compare the end of the line. —  is a ligature for  (cf. l. 17, 19, 38). —  is a ligature for  (cf. l. 11 & 26 twice, 16 three times, 17, 18). —  is a ligature for , which sign occurs throughout the entire papyrus. —  is a ligature for  (cf. l. 7, 13, 16, 19, 22, 35, 38).

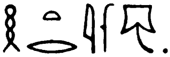
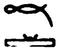
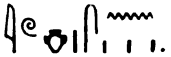
Line 11. The  is here a ligature for  (not as above in l. 2, &c.). — . Compare Pap. Sallier II, 5, l. 1.

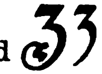
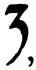
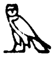
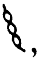
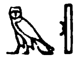
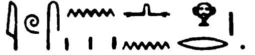
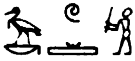
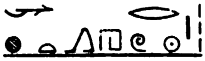
Line 12.  either was omitted by the scribe or else it is worn away in the papyrus. — . From the context. — . Supplied from l. 16. Possibly there may have been more signs in this place originally.

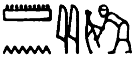
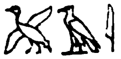
Line 13. In the *lacuna* near the middle of this line a fragment of papyrus has been added in the lithographed copy which, however, does not belong here, as the lower portion of it contains some Hieratic characters in red ink. — The in  is supplied from the context. — The  in  is supplied after the analogy of  in this line. — The  in  is worn away on the papyrus

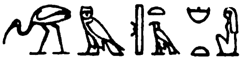
Line 14. . From the context and portions of the signs still visible. — . Worn away on the papyrus and supplied from the context.

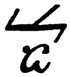
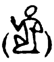
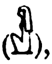
Line 15. . From the context; cf. l. 139. — The  is worn away on the papyrus.

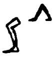
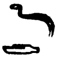
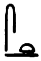
Line 16. . From the context. — For the supplied after  see l. 12 13 and 32. — . A conjectural reading.

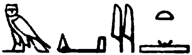
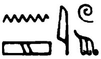
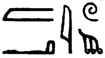
Line 17. In the word  the first sign, , although an  in form, must be transcribed by the Hieroglyphic sign , **nezem** or **nem.** The other Hieratic sign is the ligature for ; cf. note on l. 10. — . From the context. — . Cf. l. 33. — . Supplied from the usual phrase.

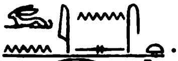
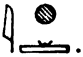
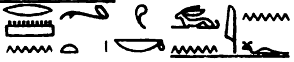
Line 18. . A conjectural reading. —  is supplied from the context.

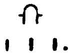
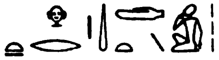
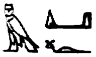
Line 19. . From the context.

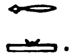
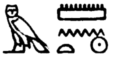
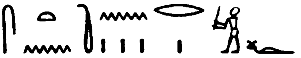
Line 20. . The original has a () instead of a (), perhaps by a mistake of the scribe.

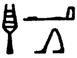
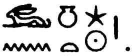
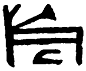
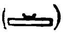
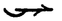
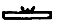
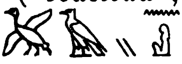
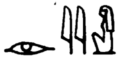
Line 21.  . Cf. l. 19. —  . From the context; cf. Erman in *Zeitschrift für Aegyptische Sprache*, 1884, pg. 33. — . From the context; cf. l. 26.

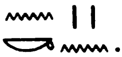
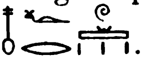
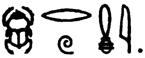
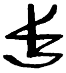
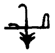
Line 22. . Cf. l. 21. — . The original has , perhaps by a mistake of the scribe.

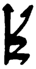
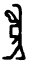
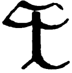
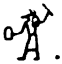
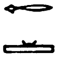
Line 24. . Cf. l. 26. — . Cf. l. 30, 62, 69 and 82. — . The Hieratic signs are quite illegible; cf. l. 25. The last signs are supplied from the context.

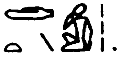
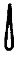
Line 25. . From the context. —  . Supplied after the analogy of line 29.

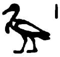
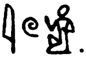
Line 26. . From the context. — . Cf. l. 95 and 97. — . From the context.

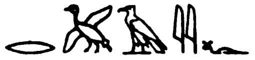
Line 27. . Cf. l. 20, &c. — . Cf. l. 41, 64, 112 and 173. —  is frequently written without the lower ; thus in l. 39, 64, 117, 118 and 119. In this passage and in l. 35, 41 and 76 there is only a dot or a dash instead, while in line 38 there is a very distinct . This ( ) is undoubtedly an inaccuracy on the part of the scribe for (). Pap. Berlin 1425 l. 29 has a  ("*bedstead*"; made of wood!), while l. 30/31 has a . — . From the context. — . Cf. l. 43.

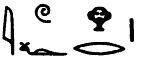
Line 28. . A conjectural reading. A portion of the last two signs can still be seen. — . Cf. line 164. — . From the context; cf. l. 44/45. —  is the Hieratic equivalent of the Hieroglyphic , **qemȧ**;

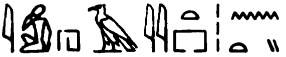
cf. Pap. Bûlâk XVII l. 4 and 18, also Pap. Berlin I l. 72. This sign is somewhat similar to  which, however, corresponds to the Hieroglyphic , ṣhes. —  or . A conjectural reading; cf. the Bakhtan Stelè l. 14, 15 and 19, and the Rituale di Leyda. — . From the context.

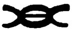
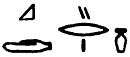
Line 29. . The scribe omitted the sign  in front of this word; cf. l. 25 and 128.

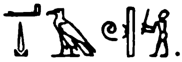
Line 31. Traces of the  can still be seen. — . From the context.

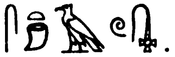
Line 33. . From the context.

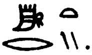
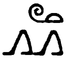
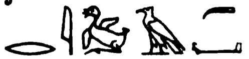
Line 34. . From the context.

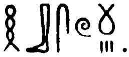
Line 35. . From the context; cf. l. 7, 23 and 46.

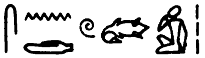
Line 36. The  is somewhat obliterated in the original, but the in  is quite distinct.

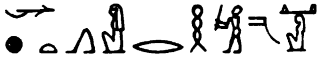
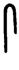
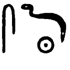
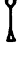
Line 38. . Cf l. 36 and 54.

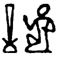
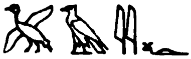
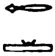
Line 39. . Cf. Pap. Sallier II pg. 5 l.1 and 8, also *Zeitschrift für Aegyptische Sprache*, 1882, pg. 164.

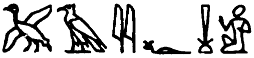
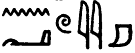
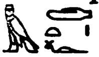
Line 41. . Cf. l. 142. The original has a horizontal line above the , just as in l. 63. —  is quite distinct; cf. l. 76. — . Cf. l. 23.

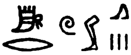
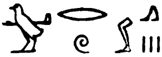
Line 42. . From the context and l. 28.

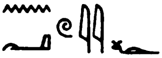
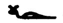
Line 43. . Cf. l. 29 and 144.

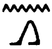
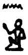
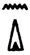
Line 44. . A conjectural reading. — The  in  ought perhaps to be a , ḥes.

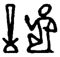
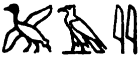
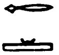
Line 45.  is omitted between  and  by a mistake on the part of the scribe.

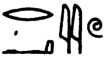
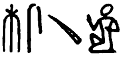
Line 51. . The original has in this passage been tampered with by some meddlesome person who supplied wrong signs in modern ink. —  . Here the same person tried his hand again, but with as poor success as before.

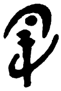
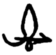
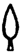
Line 52. The first sign in  is somewhat damaged in the original. It can hardly be  which occurs together with the preceding word in Dümichen, *Historische Inschriften*, I, 4.

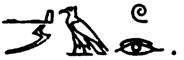
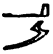
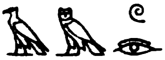
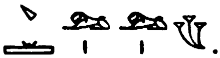
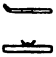
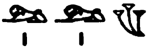
Line 53. In the word  the last sign should have been a instead of .

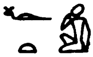
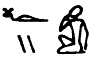
Line 54. We follow Erman and read . Others read  and even  (!). Cf. line 142.

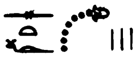
Line 55.  is omitted by the scribe between  and .

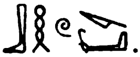
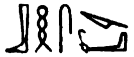
Line 59. . In modern ink, but incorrectly spelled. — . Also written incorrectly in modern ink.

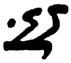
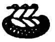
Line 60.  must be transcribed , not simply .

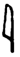
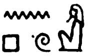
Line 71. . A mistake of the scribe for  . — . Usually written   in Hieroglyphic inscriptions.

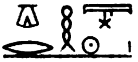
Line 72. . Brugsch (*Dict.* pg. 537) reads . Cf. also Chabas *Voyage* pg. 245 and *Zeitschrift*, 1875, pg. 168.

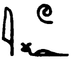
Line 73. . Cf. Brugsch *Dict.* pg. 1343 and also Chabas *Melanges* II, pg. 226.

Line 76. . A mistake for . Cf. l. 86, 89.

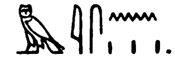
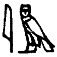
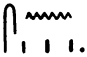
Line 93.  is the Hieroglyphic , **reḥâ**. Cf. Pap. Sallier I, 8 l. 1, Pap. Anastasi III, 4 l. 2, Pap. Sallier II, 8 l. 2 and Pap. Anastasi IV, 10 l. 5.

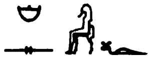
Line 113. The  is omitted before  by a mistake of the scribe.

Line 124. The in  is here written somewhat differently than usual; cf. l. 155.

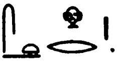
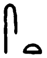
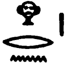
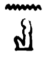
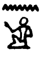
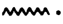
Line 125. . Written incorrectly and in modern ink.

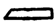
Line 127. The Hieratic sign for looks more like a .

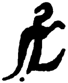
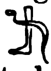
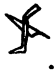
Line 128. . A mistake of the scribe for  . A transposition of letters.

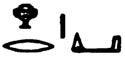
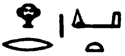
Line 138. . Written partly and incorrectly in modern ink.

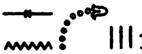
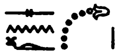
Line 143. , written in small characters above the line, is a correction of the scribe.

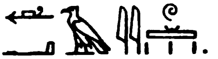
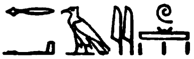
Line 146. . The  is supplied from the context, while the  is written in modern ink. — . The original reads , perhaps by a mistake on the part of the scribe. — . A wrong sign is added here in modern ink.

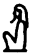
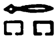
Line 147. A portion of the  is added in modern ink.

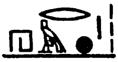
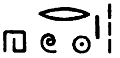
Line 149. . It is difficult to tell what Hieroglyphic ligature this sign is intended to represent. It looks very much like a , though it may be meant for a . This word seems to be a *ἀπαξλεγόμενον*, or else the scribe has made a mistake somewhere in this passage.

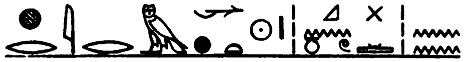
Line 151.  for ; cf. the end of the line.

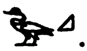
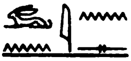
Line 152.  for ; cf. Pap. Harris I, 77, 3.

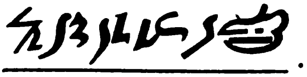
Line 154. . A mistake for .

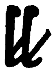
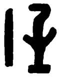
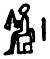
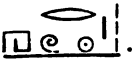
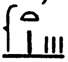
Line 158. The  is omitted after .

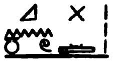
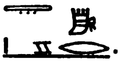
Line 161. . A mistake for ; cf. l. 174.

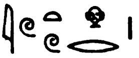
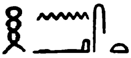
Line 165. . Carelessly written and a number of signs omitted; cf. l. 174.

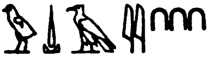
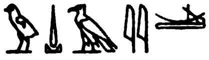
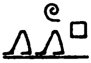
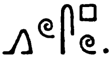
Line 167. A is omitted after . —  is supplied from the context.

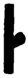
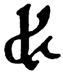
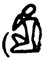
Line 168. . The original is given here as it is impossible to read this passage.

Line 175. The  is a ligature for  or ; cf. line 167. Here it serves as a determinative; cf. l. 176 and 179. — . From the context. — . From the context.

Line 176.  and . From the context.

Line 178. . From the context. — A portion of  is written in modern ink.

Line 180. . Mistake for . — . Carelessly written for . Cf. Pap. Sallier II, pg. 14 l. 11.

Line 181. . Carelessly written for  ().

Lines 184 to 188. The *lacunæ* in l. 184 and 185 are supplied from the usual princely titles. Lines 186, 187 and 188 are memoranda of another scribe or priest and have nothing whatever to do with the story or the papyrus.

Transactions of the Meriden Scientific Association.

VOL. I.

Catalogue of the Phænogamous and Vascular Cryptogamous Plants found growing in Meriden, Conn., from 1881 to 1883.
Emily J. Leonard.

VOL. II.

The Catopterus Gracilis. Chas. H. S. Davis, M. D.
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he Trap Ridges of Meriden Again. J. H. Chapin, Ph. D.
ome Notes of Africa. J. H. Chapin, Ph. D.
he Horizontal Moon. Rev. J. T. Pettee, A. M.
Supplementary List of the Birds of Meriden. Franklin Platt.
List of Butterflies of Meriden. Franklin Platt.
List of Forest Trees and Shrubs to be found in Meriden.
Chas. H. S. Davis, M. D.

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mes G. Percival, M. D., Portrait. Rev. J. T. Pettee, A. M.
werage ; Its Carriage and Disposition. Geo. L. Cooper.
he Topographical Survey of Connecticut. J. H. Chapin, Ph. D.
me Geological Features of Meriden. J. H. Chapin, Ph. D.
cadinocarpus Chapinii. J. H. Chapin, Ph. D.
he Pre-Columbian Discovery of America by the Northmen,
Chas. H. S. Davis, M. D.

VOL. V.

Review of the year 1892. Rev. J. T. Pettee, A. M.

VOL. VI.

Review of the Year 1893. Rev. J. T. Pettee, A. M.

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MERIDEN, CONN.

1897-'98.

THE MERIDEN SCIENTIFIC ASSOCIATION,

MERIDEN, CONN., U. S. A.

Founded 1880. *Incorporated 1887.*

PROCEEDINGS AND TRANSACTIONS

OF THE

SCIENTIFIC ASSOCIATION

MERIDEN, CONN.

1897-98.

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Man's Limitations. Dr. Chas. H. S. Davis

A Note on the Esquimauan Language. Hugh J. Lee

The Beginnings of Life. Dr. Chas. H. S. Davis

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Report of Curator and Librarian.

The following have been received by exchange since our last report:

GERMANY.

Altenburg.—Naturforschende Geselschaft des Osterlandes.
Augsburg.—Naturwissenschaftlicher Verein für Schwaben und Neuberg.
Bamberg.—Naturforschende Gesellschaft.
Berlin.—Deutsch-Oesterreichischer Alpenverein.
“ Gesellschaft Naturforschender Freunde.
“ Deutsche Geologische Gesellschaft.
“ Königl. Preussische Geologische Gesellschaft.
“ Gesellschaft fur Erdkunde.
Bonn.—Königl. Universitäts-Bibliothek.
Bremen.—Königl. Akademie der Wisschchaften.
“ Naturwissenschaftlicher Verein.
Carlsrhue.—Grossherz. Badische Geologische Landesanstalt.
Darmstadt.—Verein für Erdkunde und Mittelrhein. Geologischer Verein.
Dresden.—Verein für Erdkunde.
“ Naturwissenschaftliche Gesellschaft “Isis.”
Elberfeld.—Naturwissenschaftlicher Verein.
Emden.—Naturforschende Gesellschaft.
Erlangen.—Physikalisch-Medizinische Societät.
Frankfurt a. M.—Verein für Geographie und Statistik.
“ Senckenbergische Naturforschende Gesellschaft.
Frankfurt a. O.—Naturwissenschaftlicher Verein für den Regierungsbezirk Frankfurt a. O.
Freiburg i. B.—Naturforschende Gesellschaft.
Giessen.—Vereinigte Universitäts und von Senckenbergische Bibliothek.

Göttingen.—Königl. Gesellschaft der Wissenschaften und Georg-Augus-Universität.
Griefswald.—Naturwissenschaftlicher Verein für Neu-Vorpummern und Rügen.
Güstrow.—Verein der Freunde der Naturgeschichte in Meklenburg.
Halle. a. S.—Naturwissenschaftlicher Verein für Sachsen und Thüringen.
" Naturforschende Gesellschaft.
" Verein für Erdkunde.
Hamburg.—Naturwissenschaftlicher Verein zu Hamburg-Altona.
" Verein für Naturwissenschaftliche Unterhaltung.
" Hamburgische Wissenschaftliche Anstalten.
" Geographische Gesellschaft.
Hanau.—Wetterauische Geselschaft für die gesammte Naturkunde.
Hannover.—Geographische Gesellschaft.
" Grossherz. Badische Geologische Landesanstalt.
Jena.—Medizinisch-Naturwissenschaftliche Gesellschaft.
Kassel.—Verein für Naturkunde.
Kiel.—Naturwiss. Verein für Schleswig-Holstein.
Königsberg.—Königliche und Universitäts Bibliothek.
" Königl. Physikalisch-Oekonomische Gesellschaft.
Leipzig.—Verein für Erdkunde.
Lübeck.—Geographische Gesellschaft und Museum.
Mainz.—Naturforschende Gesellschaft.
Marburg.—Gesellschaft zur Beförd, der Gesammted Naturwissenschaften.
München.—Königl. Bayerische Akademie der Wissenschaften.
" Königl. Bayerisches Ober-Berg-Amt.
Münster.—Westfälischer Provinzial Verein für Wissenschaft und Kunst.
Nurnberg.—Naturhistorische Gesellschaft.
Osnabruck.—Naturwissenschaftlicher Verein.
Regensburg.—Naturwissenschaftlicher Vereid.
Rostock.—Grossherz. Mecklenburgische Geologische Landesanstalt.
Strassburg.—Universitäts und Landes-Bibliothek.
" Geologische Landesuntersuchung von Elsass-Lothringen.
Strassburg.—Geologische Landesanstalt von Elsass-Lothringen.
Stuttgart.—Verein für vaterländiche Naturkunde in Wurtemberg.
Wiesbaden.—Nassauischer Verein für Naturkunde.

AUSTRALIA.

Adelaide.—South Australian Public Museum.
Brisbane.—Queensland Museum.
Melbourne.—National Museum.
" Geological Society.
" Royal Society of Victoria.
Sydney.—Royal Society of New South Wales.
" Linnean Society of New South Wales.
" Australian Museum.

AUSTRIA-HUNGARY.

Budapest.—Ungarische Geologische Gesellschaft.
" Ungarische Geologische Anstalt.
" Musée National de Hongrie.
Graz.—Naturwissenschaftlicher Verein fur Steiermark.
Innsbruck.—Ferdinandeum fur Tirol und Voralberg.
Prag.—Comité für die Naturwissenschaftliche Landesdurchforschnng.
" Universität zu Prag.
" Kais. Königl. Sternwarte.
Trencsén.—Naturwissenchaftliche Verein des Trencsener Comitäts.
Triestre.—Museo Civico di Storia Naturale.
Wien.—K. K. Naturhistorisches Hofmuseum.
" K. K. Geologische Reichsanstalt.
" Akademie der Wissenschaften.
" Zoologisches Institut der K. K. Universität.
" K. K. Geographische Gesellschaft.
" K. K. Zoolog. Botanische Gesellschaft.

BELGIUM.

Bruxelles.—Musée Royal d'Histoire Naturelle de Belgique.
" Société Géologique de Belgique.
" Société Malacologique de Belgique.
" Société Entomologique de Belgique.
" Société Géographique de Belgique.
" Académie Royale des Sciences, des Lettres et des B.-Arts de Belgique.
Liége.—Société Royale de Liége.

BRAZIL.

Belem do Pará.—Museu Paraense de Historia Natural a Ethnographia.

Ouro Preto (Minas Geraes).—Escola de Minas.
Rio de Janeiro.—Bibliotheca Nacional.
" Sociedad de Geographia.
" Jardim Zoologico.
" Jardim Botanico.
" Museu Nacional.
" Instituto Historico e Geographico Brazileiro.
São Paulo (Campinas).—Instituto Agronomico.
" Museu Paulista.
" Comissão Geographica e Geologica do Estado de São Paulo.

BULGARIA.

Sofia.—Wissenschaftliches Institut des Fürsten von Bulgarian.

CANADA.

London (Ontario).—Entomological Society of Ontario.
Montreal.—Peter Redpath Museum.
" Natural History Society.
Ottawa.—Geological and Natural History Survey of Canada.
" Royal Society of Canada.
Quebec.—Société Géographique.
Toronto.—Canadian Institute.
" Natural History Society.

CEYLON.

Colombo.—Royal Asiatic Society, Ceylon Branch.
" Colombo Museum.

CHILE.

Santiago de Chile.—Universidad de Chile.
" Deutscher Wissenschaftlicher Verein (Sociedad Científica Alemana.
" Sociedad Nacional de Minería.
" Museo Nacional.
" Société Scientifique du Chili.
" Oficina Hidrográfica de la Marina de Chile.
" Sociedad de Farmacia.

COLOMBIA.

Bogotá.—Museo Nacional.
" Anales de Instrucción Pública.
" Universidad Nacional de Colombia.

COSTA RICA.

San José.—Instituto Fisico Geográfico y Museo Nacional de Costa Rica.

DENMARK.

Kjöbenhavn.—Entomologisk Forening.
" Dansk Fiskeriforening.
" Zoologiske Museum.
" Kgl. National Museet.
" Naturhistorisk Forening.
" Académie Royale des Sciences et des Lettres.

ECUADOR.

Quito.—Universidad Central del Ecuador.

SCOTLAND.

Dumfries.—Dumfriesshire and Galloway Natural History and Antiquarian Society.
Edinburgh.—Royal Scottish Geographical Society.
" Scottish Natural History Society.
" Edinburgh Geological Society.
" Royal Physical Society.
" Royal Society.
Stirling.—Stirling Natural History and Archæological Society.

SPAIN.

Arosa.—Illuetración Naturalista.
Barcelona.—Real Academia de Ciencias y Artes.
" Museo Martorell.
Madrid.—Academia de Ciencias Exactas, Fisicas y Naturales.
" Sociedad Antropológica Española.
" Sociedad Española de Historia Natural.
" Comisión del Mapa Geológico de España.
Sevilla.—Museo de Historia Natural.

UNITED STATES.

Albany.—New York State Museum.
Amherst.—Annual Register Amherst College.
Baltimore, Md.—Maryland Academy of Sciences.
" Johns Hopkins University.
Bloomington.—Indiana University.
Boston.—Boston Society of Natural History.
" American Academy of Arts and Sciences.
Buffalo.—Buffalo Society of Natural History.

Cambridge, Mass.—Museum of Comparative Zoology at Harvard College.
Chapel Hill, N. C.—Elisha Mitchell Scientific Society.
Charleston, S. C.—Museum of Natural History.
Chicago.—Academy of Sciences.
" Field Columbian Museum.
Cincinnati, O.—Museum Association.
Columbus, O.—Ohio State Academy of Science.
Davenport, Iowa.—Davenport Academy.
Denver, Col.—Colorado Scientific Society.
Des Moines, Iowa.—Iowa Geological Survey.
Granville, O.—Denison University.
Ithaca, N. Y.—Cornell University.
Lincoln, Neb.—Nebraska Academy of Sciences.
Madison, Wis.—Wisconsin Academy of Arts, Sciences and Letters.
Milwaukee, Wis.—Wisconsin Natural History Society.
Minneapolis, Minn.—Minnesota Academy of Natural Sciences.
Newark, N. J.—Newark Entomological Society.
Newport, N. Y.—Newport Natural History Society.
New York.—New York Academy of Sciences.
" New York Entomological Society.
" American Museum of Natural History.
" New York Entomological Club.
Palo Alto, Cal.—Leland Stanford Junior University.
Pennsylvania Academy of Natural Sciences.
Philadelphia, Pa.—Wagner Free Institute of Science.
" American Philosophical Society.
" Academy of Natural Science.
Rochester, N. Y.—Rochester Academy of Science.
San Diego.—San Diego Society of Natural History.
San Francisco.—California Academy of Sciences.
Springfield.—Illinois State Museum of Natural History.
St. Louis, Mo.—Academy of Sciences.
Topeka, Kansas.—Washburn College Laboratory of Natural History.
" " Kansas Academy of Sciences.
Trenton, N. J.—New Jersey Natural History Society.
Washington.—National Academy of Sciences.
" U. S. National Museum.

FRANCE.

Amiens.—Société Linnéenne du Nord de la France.
" Académie des Sciences, des Lettres et des Arts.

Angers (Maine-et-Loire).—Société d'Études Scientifiques.
Autun (Saône-et-Loire).—Société d'Histoire Naturelle.
Auxerres (Yonne).—Société des Sciences Historiques et Naturelles de l'Yonne.
Bastia (Corse).—Société des Sciences Historiques et Naturelles de la Corse.
Béziers (Hérault).—Société d'Études des Sciences Naturelles.
Bordeaux.—Société Linnéene.
" Société des Sciences Physiques et Naturelles.
Caen (Calvados).—Société Linnéenne de Normandie.
" Société Française d'Entomologie.
" Musée d'Histoire Naturelle.
Châlon-sur-Saône.—Société des Sciences Naturelles de Saône et Loire.
Charleville (Ardennes).—Société d'Histoire Naturelle des Ardennes.
Cherbourg.—Société des Sciences Naturelles.
Dijon.—Musée d'Histoire Naturelle.
Lille.—Société Géographique.
" Faculté des Sciences.
" Société Géologique du Nord de la France.
Lyon (Rhône).—Association des Amis des Sciences Naturelles.
" Musée d'Histoire Naturelle.
" Faculté des Sciences.
Marseille.—Bibliothèque de la Faculté des Sciences.
" Museum d'Histoire Naturelle.
Nancy.—Société des Sciences.
Nantes.—Société des Sciences Naturelles de l'Ouest de la France.
Nimes (Gard).—Société d'Études des Sciences Naturelles.
Paris.—Association Scientifique de France.
" Société Malacologique de France.
" Académie des Sciences.
" Association Françaiso pour l'avancement des Sciences.
" Société Française de Mineralogie.
" Société Géologique de France.
" Annuaire Géologique Universelle.
" Museum d'Histoire Naturelle.
" Société Zoologique de France.
Reims (Marne).—Société d'Etudes des Sciences Naturelles.
Rouen.—Société des Sciences Naturelles.
Semur (Cote-d'Or).—Société des Sciences Historiqes et Naturelles.
Toulouse.—Société Académique Franco-Hispano-Portugaise.
" Faculté des Sciences.

Toulouse.—Musée d'Histoire Naturelle.
" Société d'Histoire Naturelle.

HOLLAND.

Amsterdam.—Kon Akademie van Wetenschappen.
" Universiteit van Amsterdam.
" Kon. Zoologisch Genootschap "Natura Artis Magistra."
Gravenhage (Zuid-Holland).—Kon. Zoologisch Botanisch Genootschap.
Harlem.—Teylers Stichting.
" Société Hollandaise des Sciences.
" Hollandsche Maatschappij der Wetenschappen.
Leiden.—Rijks Universiteit.
" Ethnographisch Rijks Museum.
" Academia Lugduno-Batava.
" Rijks Museum van Natuurlijke Historie.
Société Entomologique Néerlandaise.
Utrecht.—Rijks-Universiteit.

ENGLAND.

Belfast.—Belfast Natural History and Philosophical Society.
Birmingham.—Birmingham Philosophical Society.
Bradford.—Bradford Philosophical Society.
Bristol.—Bristol Naturalist Society.
Canterbury.—East Kent Natural History and Microscopical Society.
Cardiff.—Cardiff Naturalist's Society.
Folkestone (Kent).—Natural History and Microscopical Society.
Glasgow.—Geological Society.
" Natural History Society.
Halifax (York).—Halifax Scientific Society.
Leeds.—Leeds Geological Association.
Liverpool.—Literary and Philosophical Society.
" Liverpool Geological Society.
London.—Zoological Society.
" Royal Geographical Society.
" British Museum of Natural History.
" Entomological Society.
" Linnean Society.
" Mineralog. Society of Great Britain and Ireland.
Manchester.—Manchester Geographical Society.
" Manchester Geological Society.

Newcastle-upon-Tyne.—Northumberland, Durham and Newcastle-upon-Tyne Natural History Society.
Penzance.—Royal Geological Society of Cornwall.
" Penzance Natural History and Antiquarian Society.

IRELAND.

Dublin.—Dublin University Biological Association.
" Royal Zoological Society of Ireland.
" Geological Society.

ITALY.

Bologna.—Reale Accademia di Scienze dell'Instituto.
" Reale Università.
" Rivista Italiana di Paleontologia.
Bra (Piemonte).—Museo Civico.
Catania (Sicilia).—Reale Università.
Cagliari (Sardegna).—Reale Università.
Ferrara (Emilia).—Accademia delle Scienze Mediche é Naturali.
Firenze.—Società Entomologica Italiana.
" Real Instituto di Studi super, practici e di perfezionamento.
Génova.—Reale Università.
" Società Ligustica di Scienze Naturalie Geographiche.
" Museo Civico di Storia Naturale.
" Musei di Zoologia e Anatomia Comparata della Reale Università.
Lucca (Toscana).—Reale Accademia Lucchese di Scienze, Lettere ed Arti.
Messina (Sicilia).—Reale Università.
Milano.—Museo Civico di Storia Naturale.
" Reale Instituto Lombardo di Scienze e Lettere.
" Società Italiana di Scienze Naturali.
Modena.—Società dei Naturalisti.
" Reale Università.
Napoli.—Società dei Naturalisti.
" Reale Università.
" Zoologische Station (Stazione Zoologica).
" Reale Accademia delle Scienze Fisiche e Matematiche.
Padova (Veneto).—Reale Stazione Bacologica Sperimentale.
" " Reale Università.
Palermo (Sicilia).—Società di Scienze Naturale ed Economiche.
" " Reale Università.
Parma (Emilia).—Regia Università degli Studi.

Pavia (Lombardia).—Reale Università.
Perugia.—Università Libera.
Pisa.—Reale Università di Pisa.
" Società Malacologica Italiana.
" Società Toscana di Scienze Naturale.
Roma.—Società Geologica Italiana.
" Rassegna delle Scienze Geologiche.
" Società Geografica Italiana.
" Reale Università.
" Real Comitato Geologico d'Italia.
" Reale Accademia dei Lincei.
Sassari (Sardegna).—Reale Università.
Siena (Toscana).—Reale Università.
Torino.—Musei di Zoologia ed Anatomia Comparata della Reale Università.
" Accademia di Scienze.
" Reale Università (Istituto di Fisiologia).
" Reale Università.
Udine (Veneto).—Reale Accademia Udinese di Scienze, Lettere ed Arti.
Venezia (Veneto).—Reale Istituto Veneto di Scienze, Lettere ed Arti.
" " Museo di Zoologia ed Anatomia Comparata.

LUXEMBURG.

Luxemburg.—Grossherzogliches Institut.

MÉXICO.

México.—Museo Nacional.
" Direccion del Departamento de Estadística.
" Deutscher Wissenschaftlicher Verein.
" Sociedad Mexicana de Historia Natural.
" Comisión Geológica de México.
" Sociedad Científica "Antonio Alzate."
Morelia (Estado de Michoacán).—Museo Michoacano.
Tacubaya (Ex-Arzobispado).—Comisión Geográfica Exploradora

NORWAY.

Bergen.—Bergens Museum.
" Selskabet for de Norske Fiskeriers Fremme.
" Biologisk Station.

Christiana.—Kongl. Norske Frederiks Universitet.
" Videnskabs Selskabet.
" Norske Meteorologiske Institut.
" Skand. Naturforskeres tiende Möde.
" Norges Geologiske Undersögelse.
" Norske Nordhavs Expedition.
" Norvegische Commission der Europäischen Gradmessung.
Stavanger.—Stavanger Museum.
Tromsö.—Tromsö Museum.
Trondhjem.—Videnskabs Selskabets Museum.
" Kongl. Norske Videskabers-Selskabet.

NOVA SCOTIA.

Halifax.—New Scotian Institute of Science.

NEW ZEALAND.

Auckland.—Museum of Auckland.
Christchurch.—Christchurch Museum.
Wellington.—Colonial Museum.
" New Zealand Institute.

PERU.

Lima.—Sociedad Geográfica de Lima.
" Academia de Ciencias Naturrles.

PORTUGAL.

Coimbra.—Museo y Biblioteca de la Universidad.
Lisboa.—Direcçao dos Trabalhos Geologicos.
" Museo de Historia Natural.
" Comissão Central Permanente de Geographia.
Porto.—Revista de Sciencias Naturaes e Sociaes.
" Annaes de Sciencias Naturaes.

RUSSIA.

Charcow.—Gesellschaft der Naturforscher an der Kaiserlichen Universität.
Ekaterinburg.—Société Ouralienne d'Amateurs des Sciences Naturelles.
" Museum der Naturwissenschaftlichen Gesellschaft.
Helsingfors.—Societas pro Fauna et Flora Fennica.
" Zoolog. Museum an der Kaiserl. Alexander Universität.

Jurjew (Dorpat).—Naturforscher Gesellschaft bei der Kais. Universität Dorpat.
" " Zoologisches Museum an der Kais. Universität.
Kasan.—Kaiserliche Universität.
" Gesellschaft der Naturforscher bei der Universität.
Kiew.—Kais. Wladimir Universität.
" Naturforschende Gesellschaft.
Moskou.—Société Impériale des Naturalistes.
" Zoologisches Museum an der Kais. Universität.
" Kaiserliche Gesellschaft de Freunde der Naturwissenschaften Anthropologie und Ethnologie an der Universität.
Odessa.—Neurussische Naturforscher Gesellschaft.
St. Pétersbourg.—Société Entomologique de Russie.
" Société Imperiale Minéralogique.
" Jardin Imperial de Botanique.
" Russische Kais. Offentliche Bibliothek.
" Entomologische Sammlung des Grossfürsten Nikolau-Michailowitsch.
Riga.—Naturforscher Verein.
Sebastopol.—Gesellschaft für Fischerei und Fischzucht.
" Biologische Station der Kais. Akademie der Wissenschaften.
Warschau.—Kaiserliche Universität.
" Naturforschende Gesellschaft.
" Physiographische Commission.

SAN SALVADOR.

San Salvador.—Redacción del Periódico "La Universidad."
" " "Revista del Progreso."

SWEDEN.

Göteborg.—Göteborgs Kongl. Vetenskaps och Vitterhets Samhället.
" Museum de Göteborg.
Lund.—Karoliska Universitet.
Stockholm.—Geologiska Föreningen.
" Naturhistoriska Riks-Museum.
" Kongl. Vetenskaps Akademien.
" Sveriges Geologiska Undersökning.
" Kongl. Landtbruks-Akademien.

Stockholm.—Entomologiska Föreningen.
Upsala.—Geological Institut of the University.
" Kongl. Vetenskaps Societeten.

SWITZERLAND.

Aarau.—Aargauische Naturforschende Gesellschatt.
Basel.—Naturhistorisches Museum.
" Naturforschende Gesellschaft.
Bern. — Bibliothek der Schweizerischen Naturforschenden Gesellschaft.
" Schweizerische Entomologische Gesellschaft.
Chur.—Naturforschende Gesellschaft Graubündens.
" Naturhistorisches Museum.
Frauenfeld.—Thurgauische Naturforschende Gesellschaft.
Fribourg.—Société Frobourgeoise des Sciences Naturelles.
Genève.—Soc. de Physique et d'Histoire Naturelle.
" Musée d'Histoire Naturelle.
" Institut National Genevois.
Laussanne.—Musée Zoologique du Canton de Vaud.
" Société Vaudoise des Sciences Naturelles.
Neuchâtel.—Société des Sciencies Naturelles.
" Musée d'Histoire Naturelle.
" Société Gèographique.
St. Gallen.—Ornithologische Gesellschaft.
" Naturwissenschaftliche Gesellschaft.
" Naturhistorisches Museum.
Schaaffhausen.—Scheweitzerische Entomologische Gesellschaft.
Solothurn.—Naturforschende Gesellschaft.
Zürich.—Naturforschende Gesellschaft.
" Schweizerische Palaeontologische Gesellschaft.
" Allgemeine Schweizerische Gesellschaft fur Naturwissenschaften.

TASMANIA.

Hobart.—Royal Society of Tasmania.
" Tasmanian Museum.

VENEZUELA.

Caracas.—Museo Nacional.

Robert Bowman, *Librarian.*

Report of the Recording Secretary for 1897.

With the exception of the summer's adjournment during July and August, there has been a meeting on the second Monday evening of each month.

At the annual meeting in January, officers were elected for the year.

At the February meeting Dr. Davis announced discoveries of Egyptian Papyrus; Rev. J. T. Pettee read a paper on "Practical Astronomy."

Miss Hitchcock told about Agassiz's school at Penikese, and Miss Pease talked about United States Fish Commission Station and Marine Biological Laboratory at Wood's Hole, and Mr. Aubrey read a paper on the "Shell Heaps of Florida," for the March meeting.

For the April meeting, Prof. Frost gave a lecture on the "Eating Customs of the Indian," and Hugh Lee read a paper on "The Pole in its Relation to the Garden of Eden." Rev. J. T. Pettee read Mr. Seidensticker's translation of two German poems, "The Ichthyosaurus" and "The Old Red Tavern of Ascalon," by Scheffel.

Rev. J. T. Pettee gave an astronomical report for the May meeting and read Mr. Seidensticker's translation of Scheffel's poem, "The Lake Dwellers." Dr. Davis read a letter from a Constantinople correspondent about the explorations at Nippur, Babylonia.

At the June meeting Rev. J. T. Pettee gave an astronomical report and spoke with regret of the death of Alvan G. Clarke, of Yerkes' Telescope fame. Dr. Davis furnished two articles, one about the "Lake Dwellers," and another about "The Unknown Race of Florida." Mrs. Pettee read an article from Gunton's Magazine, "The Improved Housing of the Poor." The article was written by Mrs. Ella Cooper, a former member of the association.

Prof. Frost told of his visit to several of the lakes of the Adirondacks at the September meeting.

Hugh Lee, our Arctic explorer, told of the meteorite obtained by the Peary expedition this summer, for the October meeting.

In November, Dr. Wilson gave an illustrated lecture on Mushrooms.

In December, Rev. J. T. Pettee gave a lecture on "American Astronomy in Colonial Days."

JENNIE DEARBORN WOOD,
Recording Secretary.

Astronomy

The Grand Corrector of Chronology, the Unerring Calendar of the Skies.

An Address by REV. J. T. PETTEE, A. M.

As all well know, by observing certain constellations, the hours of the night can be approximately determined. Ursa Major is very convenient for this purpose. A ludicrous incident in connection with its use occurred a few years ago in my own family. A gentleman who was somewhat in the habit of being out late nights said one morning at the breakfast table, "Mr. Pettee, what ails the Dipper? When I came home last evening it was way up there. What does it mean?" I looked him in the eye and anwered, "Three o'clock in the morning, sir." And what the stars do for the hours of night, transits, eclipses and occultations do for the ages. You've all heard the story of Columbus—how he awed the Indians and impressed them with the belief that he was a superior being, by predicting an eclipse. Unfortunately for the story no eclipse occurred at that time. It is as easy for astronomers to tell what eclipses *have* happened, and *when*, as to tell what will happen. Eclipses occur in regular cycles or periods, and it is an easy task for an astronomer to fix the date of every eclipse which has occurred since the creation. I don't mean that there is little work in it, but that it requires no very high order of mathematical genius; any second-rate astronomer would undertake the task for suitable compensation.

It follows from this that the date of any event recorded in history can be fixed if it is associated with an eclipse of the sun or the moon, or, to a lesser extent, perhaps, if associated with a transit or occultation. Let me illustrate by reference to a transit which some of us witnessed. Suppose, for hypothecation, a historian, 4000 years from now, should learn from some old monument or records, that a great earthquake had happened in Connecticut some time near the end of the nineteenth century, but should be unable to fix the exact year of its occurrence, when, accidentally, he should find that it occurred during a transit of Venus, when 2000 people were assembled in the town of Meriden to observe it, all of whom were greatly frightened but none of them injured. Now if astronomy is cultivated in the 59th century as it is in the 19th (and I have no doubt it will be and with much better results), any astronomer living then can tell him that the earthquake occurred on the 6th of December, 1882; for that was the only time near the end of the 19th century that a transit of Venus was visible in Connecticut. There was a transit eight years before, December 8, 1874, but that was not visible in Connecticut.

As another illustration, take the mysterious darkness that overspread the land of Judea at the crucifixion. Some have thought it due to a total solar eclipse; but astronomy says it could not be for two reasons. First, because Christ was crucified at the Passover, which occurred at or near the full moon, while, as all know, a total solar eclipse can occur only at new moon; secondly such an eclipse can last only six or seven minutes at longest, and seldom lasts more than three, whereas the darkness prevailed over the land for three hours. I wish, on one account, it *had* been an eclipse; it would have fixed the exact date of that tragic transaction. For a similar reason I wish that the Star of Bethlehem could be identified with some astronomical phenomenon.

Many dates of great historic events have been unalterably fixed by their correspondence or association with astronomical phenomena, the most important of which to us is the date of the Nativity, which is fixed by a lunar eclipse, which, according to Josephus, occurred the night before the death of Herod, in the year of the Julian period, 4710, which reduced to our present calendar, would be 4 B. C. Fortunate that this, the only eclipse mentioned by Josephus, should fix the date of the birth of Christ. Of less importance is the opinion of astronomers that the eclipse mentioned by the Prophet Amos, viii, 9, occurred February 9, 784 B. C., and that mentioned by Micah, iii, 6, on June 5, B. C. 716, and that alluded to Jer. xv., 9, on Sept. 30, 610 B. C.

But passing these, for the present, I wish to show how astronomical phenomena, especially eclipses, have served to verify events and epochs of Chinese history.

Seven years ago Rev. James Legge, Professor of Chinese in the University of Oxford, England, gave a lecture upon this subject before the Victoria Institute, or Philosophical Society of Great Britain (of which society I deem it an honor to be an invited Associate), and his profound and able lecture is my authority for all that I say on this subject.

But before I quote largely from it I wish to premise two things. First, the Chinese were an astronomical people; second, no other nation has such ancient and well-connected history.

They were an astronomical nation. Prof. Simon Newcomb is my authority for saying that as early as 2143 B. C., Hi and Ho, two astronomers royal, were executed, because, getting drunk, they neglected to predict a forthcoming solar eclipse, and the eclipse came upon the Chinese unawares, and they had no opportunity to propitiate the gods by the accustomed sacrifices. And it seems to me that at this remote time (4041 years ago), China must have been pretty well stocked with astronomers, or she could not have afforded to sacrifice two of them. Had they been the only astronomers in the empire their lives would have been spared for future service whatever their dereliction of duty.

The other point that I make is: No other nation has such ancient and well-connected history, and no other ancient nation has taken such pains to preserve it; on which point I am abundantly supported by Professor Legge. From this eminent Chinese authority I learn that each dynasty appoints historians to write up the history of the preceding dynasty. For instance, the latest of these histories is that of the Ming dynasty, extending from 1368 to 1643, 275 years. As soon as the present Manchau holders of the Empire thought they had sufficiently consolidated their rule, a commission was issued to 58 men of literary eminence to compose the history of the Ming dynasty, and the result was laid before the emperor in 1742, 63 years having been devoted to the work. This method is supposed to secure impartiality of treatment, and certainly gives access to all contemporaneous history, as all the archives of the Empire are open to the writers.

Prof. Legge says, "We have in what are called the Twenty-Four Dynastic Histories records coming down to the year 1643, and professing to extend over a space of 4343 years. These records are contained in 3264 books or chapters. My own copy of them, bound in English fashion, forms 73 portly volumes of imperial octavo size." I copy this long statement to show the truth of the statement, that no other nation has such ancient and well connected history, and no other nation has taken such pains to preserve it.

And now for its verification. Here astronomy comes to our aid. Fortunately for us the Chinese had astronomers,—astronomers able to calculate eclipses. And fortunately for the astronomical verification of their histories, the dynastic historians coupled many of the events which they recorded with solar or lunar eclipses; for, as we have seen, astronomers can tell just when these eclipses occurred, and in this way determine the truth or falsity of the Chinese chronology.

Says our author, speaking of the Chronicle of Confucius, which covered a period of 242 years (from 723 to 481 B. C.), 'The Chronicle contains the record of 36 eclipses of the sun as occurring during this period, of which 32 have been verified as far as the years and days assigned to them are concerned. The month of some of them is not correctly given, but I will show, ere we have done, that what seems to be an error of the month confirms the genuineness of the entries." And the learned Professor sums up the results of his historico-astronomical researches in this statement, "I may venture to say that of no ancient history is the chronology so well authenticated as that of China since the era of Kung-Ho, B. C. 842." This carries us back 2740 years—nearly 3000 years of well connected history. Thanks to astronomy for it!

But how about the history of China before 842 B. C.? Does astronomy confirm that? I answer yes, but not as fully. There are fewer events associated with eclipses than in the 2740 years we have considered, but where they *are* the date is found correct by the calends of the skies, and on astronomical pinions the history af the Empire is carried some 2000 years higher.

Take a single instance. In one of the great books of Chinese Chronicles it is stated that in the reign of Chung Kank, one of the early emperors, there was an eclipse of the sun, in the sign Scorpio. The particular year is not mentioned, but only the month and the day. The received chronology refers it to the first year of his reign, 2159 B. C. But here astronomy comes to the aid of chronology, and two eminent German Professors, Dr. G. Schlegen of Berlin, and Dr. Franz Künest of the Imperial Observatory, Vienna, fix the date of the eclipse on the 7th of May, 2165 B. C., and by fixing the date of the eclipse fix the date of this emperor's reign; and whether the verification of Chinese chronology can be carried back farther than this will depend entirely upon whether historic events have been made to synchronize with eclipses and other astronomical phenomena.

The earliest periods of Chinese history are those of Yâo and Shun. Of the Shun dynasty our author says, "I do not indeed believe that the compilation of the Shu was made, as Chinese authorities affirm, by Confucius; but he was well acquainted with it, and both he and Mencius regard it as giving the earliest accounts of the national history. The existence of Yâo, Shun and Yü is not to be doubted. I should as soon doubt the existence of Abraham and the other Hebrew patriarchs in our sacred Scriptures. The question is not as to their existence, but as to the time to be assigned them on the chart of chronology." In the canon of Yâo, which forms the first book of the Shu, that sovereign is found instructing his astronomers to determine the solstices and equinoxes by the culmination of certain stars which he specifies. Dr. Pritchard, Savilian Professor of Astronomy at Oxford, prepared for Prof. Legge a chart of the stars as they appeared in China 2300 B. C. "An inspection of this chart," says Dr. Legge, "shows that all the phenomena mentioned by Yâo might have been seen by an intelligent observer at that date."

The result of our learned Professor's profound inquiries, given in his own language, is this: "About the era of Küng-Ho, in B. C. 842, there can be no doubt; and China was then a very considerable nation. Of earlier dates we cannot speak with the same certainty, but we seem to be able to trace the points of its history up to B. C. 2000, and a few centuries beyond it. Up to the 24th century B. C., the chronology of China may be pronounced historic."

And in view of this statement by one of the greatest living scholars,* who can suppress the wish that other nations had recorded astronomical phenomena, especially as they synchronized with events of their national history? The Egyptians and Assyrians did this to some extent in their sculptures and inscriptions (witness the Zodiac of Dendereh), but not, like the Chinese, in well-connected history. Had the Egyptians observed and recorded some eclipse of the sun or moon the year the foundations of the Great Pyramid were laid, or the year it was completed, had the Assyrians had the Chinese habit of recording astronomical phenomena in connection with important events of their national history, the astronomers of the present day could easily tell the exact year of the event recorded.

And had the writers of modern history paid more attention to eclipses which synchronized with events of their histories, these eclipses, calculated backward, would fix many a disputed date beyond the possibility of question. Had Eric the Red when he

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*Alas! Prof. Legge is no longer a *living* scholar; he died at Oxford November, 30, 1897, æt. 82.

doubled Cape Farewell, or Lief, his illustrious son; or Thorwald, his bold successor, when he first landed on the coast of New England, observed some astronomical phenomenon, if it were no more than an eclipse of the moon, if the date were not given, that observation would have been worth more than all the grapes he carried home to Greenland. The date then of these events, so intimately associated with the discovery of the continent, would not be uncertain by one or two hundred years, but would be fixed with as much certainty as any event of the American Revolution.

Thus you see, ladies and gentlemen, the heavens afford an unerring chronometer. It never runs down. It never needs winding up. It never varies, except by those long, cyclical variations, like the precession of the equinoxes, which are well understood by astronomers and for which allowance is made in all their far-reaching calculations.

I might continue, but think I have said enough to justify the title of my paper: Astronomy the Grand Corrector of Chronology, the Unerring Calendar of the Skies.

The Lakes of the Adirondack Region.

BY SIMEON TAYLOR FROST.

Without accounting for the entire earth, we may yet doubt that any other part presents, in a like degree, the prominent features of the Adirondack regions. As large as the state of Massachusetts, one-sixth the size of England, within four hours run of Greater New York—that most numerous aggregation of human beings, London excepted—it never has been, and it never will be, really occupied as a human habitation. Of all the continents it was the first land to emerge and look forth over the stormy Silurian deep. French, Dutch and English civilization set foot on its borders three hundred years ago; it is closely encircled on every side by a crowded population; great thoroughfares of travel line every edge of its circumference, and yet it is used now very much as the Indian used it at first—if, indeed, he used it at all—as a summer resort. If the timber were removed, and then the boulders, it would be hard to find fertile ground for the smallest farm. Agriculture will sooner locate in Alaska than in the Adirondacks. Mountains often afford rich valleys, and "slopes of pasture sunny warm," but in the Adirondacks the peaks are thickly crowded, their slopes are steep, and the valleys are filled full with lakes, the mountains rising from their very rim.

We can still recognize the picture that Cooper sketched in "The Last of the Mohicans" some seventy years ago.

"The party had landed on the border of a region that is, even to this day, less known to the inhabitants of the States than (are) the deserts of Arabia or the steppes of Tartary.

"It was the sterile and rugged district that separates the tributaries of the Champlain from those of the Hudson, the Mohawk and the St. Lawrence. Since the period of our tale, the active spirit of the country had surrounded it with a belt of rich, thriving settlements, though none but the hunter and the savage are ever known, even now, to penetrate its wild recesses."

These lakes occur every two or three miles, and they number not less than a thousand. The guides say that there are twice as many. They lie within that wonderful lake belt, the most beautiful picture, perhaps, of Physical Geography—which extending across our continent from the Arctic to the Atlantic, reaching out like a curved arm with the Great Bear at the shoulder, the Great Lakes at the elbow, and dividing into fingers over northern New England. Maine alone has fourteen hundred lakes not less than a mile across.

This line of lakes across our continent outlines the occurrence of the harder rocks. Accepting the theory that the gullying, gouging and scooping of the glaciers created these lake basins, then the whole region covered by the great ice blanket was filled with lake pools. Where the rocks were soft the dam at the outlet was soon worn away, and the surrounding banks in like manner quickly, as geologic time goes, filled in, and so by drawing down and filling up the lakes became swamps. These swamps which drainage and cultivation has changed into meadow levels, covered at the period of settlement a large part of New England and the Middle States. Excepting those who lived by, and by means of the sea, the first settlers were dwellers of the hills. Here ran the lines of road; here were placed the meeting-houses; here only were firm footing and dry burial.

But not the granite grit of the Adirondacks is too hard for the corroding tooth of time. Where the rock dam at the outlet was narrow; where there is a chain or collection of lakes; where there was any considerable outlet to create a current, there it is easily seen that the lake has been drawn down, sometimes thirty feet below its original level. It is interesting to see, in some instances, this old level completely restored. North and South Lakes and Kan-a-shu-gaw-la are now used as storage reservoirs for the Erie Canal. These have been raised by dams to their original level; in the case of North and South lakes about twenty-six feet. When the vegetation had been killed by the flooding it was seen that a beach of white sand connected the two levels. These lakes are drained by the Black River.

Other lakes, however, show scarcely any wearing of their rock dams, and are yet full to their very brim. Honnedaga Lake, five miles long, is a vast spring with only spring brooks for tributaries. Its outlet flows for a good distance over a granite rock table, and still further protected by lodgments of sand and pebbles. Having no current, the ice in the spring simply dissolves, and there is no rasping effect of ice cakes passing over this rock dam. This lake is a gem, "an eye of the forest."

Thoreau has remarked the stillness of the Maine woods,—there was little life revealed there even to his sharp eyes and ears. The Adirondacks keep the same forest hush, just enough to bring out the insect hum. The presence of animal life is everywhere, of course, a matter of food supply; where the carcass is, there will the eagles be gathered together. We find no nut trees, and therefore no squirrels except now and then a red, taking, like Hiawatha's Ajidaumo, the poor picking of a pine bur. The half-tamed birds, like the robin and his cousins, which seem to find in human inhabitation with its fruits, and, we may add, the pests of the fruit trees, their helps to a living, are seldom met with. Fly-catchers are abundant for the most obvious reasons; their food supply seems least likely to fail. Partridges have the coziest winter shelter in the rock ledges, abundant winter food in the next year's buds, and insects for the breeding season.

The wild or passenger pigeon formerly nested every third or fourth year in the Adirondacks, coming in numbers that actually darkened the sun over a wide space. Doubtless no aggregation of land life ever equaled that of pigeons at their breeding or roosting places. The bird may now be said to be an extinct species. They would be seen in the Adirondacks if anywhere. Johnny Leaf, a Mohawk Indian and child of the forest, has not seen one in ten years. Mr. Edward Haskell, who has for a longer time collected eggs for the Smithsonian, made the same report, and all the guides confirmed the opinion that there was not a wild pigeon in the Adirondacks. The moose has also disappeared. "Forty-nine years ago next March," said an old hunter, "I and three other hunters shot a moose somewhere near this spot." Digging about an old stump, he added, "and here are the coals of our fire. We made a wrap for the night of the warm skin." The overhanging mountain was named Bull Moose for the last of the species killed in the region. A bear is occasionally shot, but this is a sporadic case.

But for the dun deer, the Adirondacks are, and are to be, a vast forest park. The thousand lakes, whose solitudes are loved and deepened by the loon, were made for their pasture and protection. Whenever a lake has been drawn down as described there are long stretches of shallows covered with lily pads, and the deer now, as in Solomon's time, "feed among the lilies." Hunting with dogs is now prohibited by law, as is also "jacking,"—hunting by night in the lake with a decoy light. It is now a fair and even contest of wit between the hunter and the deer, and if the former is an amateur the advantage is plainly with the latter. Trout and deer, if properly protected, will always furnish abundant game.

It is now the purpose of the State to work in line with the evident purpose of nature, and to control the vast region for a forest preserve for the people's use. It has appropriated $1,000,000 for the purchase of land from individual owners. It is proposed to commit a large tract to the care of Cornell University to be treated according to the principles of the science of Forestry. Permission is now given to any who shall apply to set up a tent and camp for an outing.

The Adirondacks have another appointed use. They will, in the future, furnish a pure water supply for Greater New York, and for all the larger intermediate cities. A region of garden fertility there would be less valuable to the State than this glorious desert wilderness.

The Adirondack highway follows the line of lakes and their connecting trails. Transportation means a pack upon the back of your guide, or, if you wish to expedite and share the burden, upon your own, he protesting. This pack is a basket shaped like a fish creel strapped to the shoulders, and holding about a bushel. Seventy pounds weight is enough for climbing hills as steep as stairs and lacking steps. The guide wears the canoe like a great hood supported on his shoulders by a cross yoke. Its weight is about forty pounds. When he comes to a lake he seats you in the bottom of the canoe, and balances the craft by a judicious disposition of the pack, the fishing tackle, the axe and guns; you do nothing but keep perfectly still. He takes his seat upon a broad strap of deerskin. The propelling power is a paddle of soft maple four feet long. The paddle is applied on one side of the canoe, a dexterous twist at the end of the stroke keeps the canoe in line; the sheltered lakes are always smooth, and you glide, glide along in the most restful stillness. The voyage and the portage mutually relieve each other. The trails are sometimes very rough, but with always one appropriate place for the foot, though there are often long, smooth, level stretches under grand forest arches. One cannot imagine a more delectable pilgrimage. At night, in camp, you have

"The silence that is in the starry sky;
The sleep that is among the lonely hills."

Man's Limitations.

BY DR. CHAS. H. S. DAVIS.

How insignificant and little appears individual man in the infinity of the universe, and yet his senses reveal to him but an insignificant part of it. The endless and incomparable glories that are, and ever will be, are out of the range, not only of the vision, but of the imagination. All of his knowledge of phenomena is gained by the report of his own imperfect senses, colored by his prior conceptions and imperfect reasoning, and multitudes of people rarely lift their thoughts above their individual surroundings in which they spend their lives in sensuality and drudgery. What they call the universe is simply what they perceive and that occupies only the little space of consciousness and reason, and beyond that they do not perceive anything at all. Man is but a grain of sand upon the ocean of time, a barnacle attached to this globe which is whirling through infinite space in a mighty orbit 580,000,000 miles in circumference, around the sun, at the rate of 1,000 miles a minute. He is simply a very minute portion of the great body called Humanity, which under all circumstances continues to live, and will continue to live and progress, as long as there is a living being on the globe. Mankind is one great totality, a form of motion that sweeps over the ocean of matter. There are many persons who suppose themselves hovering in a higher world, when they are in fact creeping on the earth. They are so magnified by their own importance, that they think they are the pivot upon which the universe revolves.

Our earth is one of the smaller worlds in the vast starry universe, and it is one of the most insignificant and accidental products. It is a mere atom in an unimposing system, amid the magnificent panorama of the cosmos, and mankind are but little ants, or tiny insects crawling over the surface.

Space extends outside the boundary lines of our imagination, and the human race will await many ages longer, and, perhaps, never obtain an exhaustive theory of the universe, or be able to explain the mighty deep of creation's fathomless sea. The nocturnal sky, with its millions of silent and scintillating worlds, floating mysteriously in the fathomless deep of the universe, may ever remain a mystery. When we remember that all the fixed stars are the suns of other systems resembling our own, and in many cases vastly larger than our own, for our sun is only one of the smaller stars of our sidereal universe—over 100,000,000 of which are visible through our largest telescope,—and that the infinite space is filled with untold numbers of such systems, then can we appreciate the comparative insignificance of our little world. Our solar system, instead of being the center of a group of brilliant and comparatively insignificant stars, "set like golden lamps in a firmament that is hemmed in the narrow world," is merely one member of a vast cluster of solar systems. Sirius is twenty times as heavy as our sun, sixty times as bright, and is sweeping through the heavens at the rate of 1,000 miles a minute, although it looks stationary to us. Arcturus is 8,000 times as brilliant as our sun, and eighty-one times as large, and is so far off in infinite space, that it takes two hundred years for a ray of light to reach us, and notwithstanding the enormous distances which separate stars from each other, there are yet vaster distances beyond the mind of man to conceive. Our sun, in fact, is a mere rush light and glow-worm, as compared with many of the huge luminous bodies which pour their glories adown the immensity of nature. This little planet of ours is only 8,000 miles in diameter, while Jupiter is 89,000, and Saturn 79,000, Uranus 35,000, and Neptune 31,000. When we think of these magnificent proportions, we are obliged to confess ourselves and our home mere atoms.

While our little earth is revolving around the sun, the sun itself and the whole solar system, and the whole universe of suns, with all their countless fleets of planets and moons which they represent, are all moving with inconceivable velocity, and revolving about a last centre of centres, billions of miles away, for it takes thousands of years for a ray of light from some of these suns to reach our earth.

Says a writer, could we reach the confines of our limited universe to a distance so great "that the interval which separates us from the remotest fixed star visible in our largest telescope, might be considered as merely a step on our celestial journey. What further creations might not then be revealed to our wondering vision? Systems of a higher order might there be unfolded to our view, compared with which the whole of the visible heavens might appear like a grain of sand on the ocean shore—systems, perhaps, stretching out to infinity before us, and reaching at last the glorious 'mansions' of the Almighty, the Throne of the Eternal."

How can man with his puny intellect grasp the divine mystery of Creation—the whole plan and control of even one universe such as ours? Physical science has destroyed the theory of a unique and transcendent interest which antiquity had attributed to our little and comparatively insignificant planet among the heavenly bodies. The universe is an endless realm of space, in which ten thousand times ten thousand systems of suns and planets are ever rolling; and in our egotism man is prone to think that our little world, with its few inferior satellites, is the universe.

Every man's knowledge or understanding of the world is restricted by his experience of the universe as he knows it. Thus the number and nature of one man's cognition—the empiric contents of his mind—will differ from those of another, just as their respective worlds differ. The more fully developed intellect, therefore, is that which possesses the greatest number of objects, and is capable with more less accuracy of discriminating between objects. Man is hopelessly incompetent to understand the mysteries of his own being, much more so is he to understand the illimitable scheme of the universe, or to grasp in thought the everlasting and incomprehensible ordinances of nature. Only the ignorant man believes he knows everything. There are many persons not only ignorant, but are ignorant of their ignorance. These are babblers of vain philosophy, who nurse folly and call it wisdom; who build up and nurse pet theories—theories planted in nothing, and leading nowhere. There are many one-idea men, whom it is impossible to get out of their narrow rut, who refer the whole world to their own center and unravel all matters by their one rule. Such men reach all manner of fanciful conclusions through reckless reasoning from analogy, and the less they know about the laws of things, the greater will be their credulity. Knowledge consists of ascertained facts. Knowledge is like food. It must be digested, assimilated, and turned into power through the activity of the brain. It is impossible for an untrained brain to digest and assimilate facts. To think and reason logically requires a long course of study. A person of loose and desultory mental habits, must necessarily have ideas weak, disjointed and inconsistent. Just in proportion as one forms the habit of accurate discrimination, close attention, and logical reasoning, does he gain strength to meet the demands of intelligent life.

To-day three-fourths of the globe is heathen, or but semi-civilized. And in civilized communities there are millions sunk in sodden ignorance, and living lives of children or savages, in virtual darkness and poverty of thought, and the hopeless monotony that characterizes the life of the great masses of people. A large majority of persons spend their lives in mere drift, drifting along with the tide, and not reaching out for the opportunities that lie by the wayside, or exercising those energies which are inherent in every human being; the same energy that causes the plant to grow, and the tree to put forth its leaves to inhale the air, and which sends its roots in search of moisture. A brute is guided by instinct, only man has reason for his guide, but his dense ignorance prevents him from being benefitted by it. Ignorance, unconsciousness and death are synonymous terms, and every one is dead in proportion as he is ignorant.

The feverish activity of life, the eager interests, the numerous passions, and the great strain of mental work incident to the multiplied industries and eager competition of our present civilization, prevents men from training their minds or giving time to abstract study, and they are even glad to have some individual look after their spiritual affairs, thereby saving them trouble, and allowing them to devote such energies as they possess to making money, and to the sensual pleasures of life. The intellectual life of the whole mass of society needs quickening. Ignorance becomes a sin when a man might be wise. Man is blessed with a mind which is capable of cultivation. A piece of common coal has its cohesion, attraction, gravitation, heat and light differentiated, hence also electricity and magnet. These forces are in the coal, immanent and permanent. But it will always remain a piece of common coal unless these forces are developed.

Our ideas of external objects, and of the associations that they give rise to in each individual, are owing to numerous factors, such as hereditary disposition, education, habit, development of the mental and moral powers, the peculiarities of climate and country. He who obstinately refuses to cultivate the mind within him, to exercise those mental powers by means of which he is elevated above the brute .creation, not only allows himself to sink to the level of the brutes, but deprives himself of the greatest pleasures of life. There are those who are free, yet choose littleness and bondage, who nourish the small things of life, exaggerate the petty vices, move through life in a narrow groove, censorious, fussy, and with an intemperate zeal for the little things of life, and thinking of the things of sense, a single, narrow round of existence. It is true that multitudes of human beings come into the world weighted with a destiny which they have neither the will nor the power to contend, and they are born with an innate incapacity of mental development under any circumstances. The education of man begins, not with the alphabet, but in embryo, where the foundations of character are laid by the impressions made on it. Some one has said that a man's education begins with his forefathers.

A writer has said, "Though to us new discoveries seem like new truths and new science, yet they are obviously but features of the world's phenomena or conduct that we have but just laboriously developed to a faint comprehension of, and which have been lying for all time in the uses and factors of the world, and yet unborn to our apprehension. Out of the infinite number of functions that constitute a world, how few fall to man's share of comprehension. Within and around us, unseen and incomprehensible wonders crowd in constant action of their distinctive work, and yet we would measure all powers and existences by the foot rule of our ignorance and presumption."

We are continually reminded of the finite and limited character of our intellectual faculties. Among the infinite variety of phenomena we never succeed in meeting and observing more than the most infinitesimal part, and there is every reason to believe that there is an infinitely greater portion that is entirely beyond the reach of what are called the five senses. Some animals have been proved to possess certain senses in a far more highly developed form than they are found in man. There are, no doubt, imponderable agencies of great power in this world, other than those which modern science recognizes. Only a few things do we know with certainty. There are riddles in every ray of light, in every blade of grass, too profound for the most expert investigator.

The only knowledge that we have of the world is through five outlets. Close these five outlets, and no means whatever remain of possible communication with the imprisoned with the material world. There is situated in the very middle of the brain, a small ovoid body of reddish color, having four small elevations on the surface containing ganglions of nerves. If the first or anterior ganglion is destroyed, the sense of smell is obliterated; if the second ganglion is destroyed, there is a loss of sight; if the third is destroyed there is a complete loss of sensation, and if the posterior is destroyed the sense of hearing disappears. This small ovoid body is, therefore, the gate by which all stimuli from without enter the brain, and is the only means of communication by which the region of psychical activity come in contact with the exterior world.

At present we are at the mercy of an imperfectly developed nervous organization. with its five special senses, which, though very far superior to the lowly nervous development of our remote ancestors of millions of years back in the history of life, is perfectly inadequate for the solution of the great problem of existence. That which we know now is no criterion of what man will know generations hence. There are many things in nature of which he has not, and cannot have, any kind of knowledge. A new sense conferred upon him might alter the whole aspect of the universe. If we had a dozen senses instead of five, there would be impressions and emotions as beautiful and as pleasant as those arising from our present senses, but which are now wholly unrecognized. The external world, as we conceive it through our forms of perception and modes of thought, may have no resemblance whatever to the absolute reality. There are many reasons for believing that animals are not confined to our five senses. If animals can see in the dark—*i. e.*, where it is dark to the human eye—the optic nerves of those creatures are affected by etheric vibrations to which the human eye does not respond. Some persons cannot distinguish even the simple or primary colors, as, for example, red from blue, or green, while the weavers of Asia distinguish with certainty two hundred or three hundred shades, which are entirely undistinguishable to ordinary Western eyes. Man's ear is tuned to no less than eleven octaves of sound notes, but his eye is capable of distinguishing only one octave of light-notes. There are, however, light notes so low down and light notes so high up that our eyes cannot detect them. Beyond the violet in one direction, and the red in the other direction, our eyes are neither aware of light nor color, and yet, undoubtedly there are many colors which we do not see, owing to the defective nature of our vision.

All waves of sound coming to our ears in the shape of ten or twelve waves per second, or in the shape of 50,000 or 60,000 waves per second, are absolutely unheard by us. A fly cannot walk across a window pane without a noise, though to us its footsteps are inaudible. Says Professor Huxley in his "Physical Basis of Life," "The wonderful noon-day silence of a tropical forest, is, after all, due only to the dullness of our hearing; and could our ears catch the murmur of these tiny maelstroms, as whirl in the innumerable myriads of living cells which constitute each tree, we should be stunned with the roar of a great city."

It is commonly supposed that we see with our eyes, hear with our ears, and so on. But it is the brain and the mind which really sees, and hears, and feels. These organs of special sense are merely the apparatus by which the forms or sound or other sensible property of objects are received from the world without. All impressions from the outer world exist only in our self-consciousness, and what is left of this universe of mechanical material construction, is a mere automaton. So it is the intelligence and self-consciousness upon which we rely for any and every knowledge of the outer world. The phenomena of nature and the objective world is to each man the sum of his visionary experience; an existence bounded on all sides by what he feels and thinks; a form shaped by the reaction of his organism. The world is the sum total of phenomena. There is a much more extended universe than that of the senses or of worldly experience, and there lies in human nature the germs of powers which have never been perfectly developed. There are natural laws of the operation of which exoteric or popular science is densely ignorant. This is evidenced in well-authenticated phenomena of hypnotism, telepathy, psychometry, etc. Thus it has been absolutely demonstrated by experiment after experiment, by men of scientific training, and therefore capable of weighing evidence, and who are not ignorant enthusiasts and therefore unfitted for scientific research, "that sensations, ideas, information, and mental pictures can be transferred from one mind to another, without the aid of speech, sight, hearing, touch, or any of the ordinary methods of communicating such information or impressions."

Out of the millions of people who constitute a nation, only a few thousand men represent its social activity in all its aspects, its politics, its industry, its commerce and its intellectual culture. But notwithstanding all the labor of men with trained minds, such are the limits of man's acquirements that it is not the property of the human intellect to mentally create or evolve mind material *de novo*. Existing ideas and conceptions may be arranged, re-arranged, and elaborated, and novel forms produced as varied as the figures in the kaleidoscope. But we must remember that there is ever a pre-determined, a solemn march, in which all join, "ever moving, ever resistlessly advancing, encountering and enduring an inevitable succession of events." Human brains everywhere and always reach in a common an identical manner in presence of the external excitations which impress their sensorium. A well-known French savant (Luys) says, that the history of ancient literature shows us that in the same situations, human beings have always acted in an identical manner. In every page of their tragic or comic works, we find that common fund of immortal truth and judicious reflection, which will be eternally carried and applicable at every epoch. Luys also shows that there is in humanity a sort of general arrangement of ideas and sentiment, by virtue of which all men automatically take the same direction in the same definite circumstances, and judge of surrounding things in an identical manner.

Superficial education makes the mind a ready receptacle for every kind of imposture, and has been the cause of the rapid spread of many modern delusions. Many presumably sane and well-meaning persons ignorant of scientific matters and persistently ignoring facts, will swallow whole the most transparent frauds. To them the unchangeable and unalterable laws of the universe amount to nothing, and they fly in the face of facts which are well known and proved. In fact the gullibility of man is one of the most prominent features of his nature, for a lack of knowledge is always accompanied with a lack of critical power. There is such an inherent tendency, belonging to the weakness and dependence of human nature, in the mind of man to ascribe to supernatural agencies those events the causes of which are beyond his knowledge. Anything that his limited intelligence does not allow him to understand, must of necessity be supernatural. The credulous and ignorant are profoundly impressed and easily led astray by the most apparent frauds. Their love for the marvelous is so great, and their logical powers so small, that they are led to entertain any belief, no matter how preposterous it may be. Everything inexplicable rises to the supernatural. It may be taken for granted that popular notions are habitually incorrect, for the great majority of mankind are entirely incapable of instituting a scientific inquiry into truth, or following out well-known or well-defined intellectual processes. It is a melancholy fact in this enlightened age, dupes should be found to believe, or self-constituted miracle workers, presume to operate on the credulity of mankind, but there is in every person a love of the marvelous, and a preference ever given to the extraordinary over the natural. Notice the morbid and exceptional forms of mental and nervous symptoms, as evidenced in modern spiritualism, where thousands of people will listen with awe to the rappings of invisible knuckles, or who ponder with something akin to reverence, over the weary platitudes or doggerel verse supposed to come from the mighty dead. When we see the amazing credulity on the subject of professional "mediums," we can well term them rogues and their dupes. This is a field in which charlatanry and imposture has abounded limitlessly. The doctrine of human intercourse with invisible beings is as old as superstition.

How many thousands are constantly tempting fate by games of chance, who are absolutely ignorant of the theory of probabilities. It is extraordinary in this enlightened age to have so many people talk about "luck," good or bad, and this not entirely among the ignorant and uneducated. A man blames his luck, when he should blame some specific short-coming in his own conduct. It is even fashionable to talk about "mascots" as contributing to the good fortune of its possessor. The horse shoe still hangs over many doors. An old slipper is still cast after the bride and a new ship is christened with a bottle of wine, and one is very apt to turn the money in his pocket when looking at the new moon. How many persons there are who think that the breaking of a mirror, or hearing the ticking of the wood worm concealed in the wall, heralds a death in the family; who will carry a horse-chestnut in his pocket, or wear a metal ring on the finger to cure rheumatism; who always ascend the stairs by stepping with the left foot first, or who will refuse to sit at the table with thirteen persons; who will not start anything important or start on a journey on Friday; putting the wrong foot out of bed in the morning; neglecting to place the shoes with the heels towards the bed at night; bread must not be placed with the upper crust down, or look at the new moon over the wrong shoulder, or step over a straw. A full collection of these puerilities would require a volume. In all of them is seen a servile fear of mysterious evil influences, lurking on all sides. Thoussands of people at the present day are as full of superstition as the Zulu, who chews a piece of wood in order to soften the heart of the man with whom he is about to trade cows.

Quacks are some of the modern magicians, and quack medicines the charm of the present day. The patent medicine business is founded upon human credulity. It is well known to those who have experience in advertising secret nostrums to the public that the contents of the bottle has really very little to do with the success of the business. The secret of success is, to a very great degree, in the advertising. The fact that one does spend a great deal of money in building up such a business should merit a term in the penitentiary.

Diseases are the necessary result of disobedience of the laws of nature, and they are the consequences of sins that cannot be forgiven. If the medical profession were enlightened as they should be, they would not try to cure the disease instead of the patient. The disease is nature's curative effort. Sometimes the disease is cured but the patient dies. If the patient recovers from the first disease, he often has a second disease fastened upon him, owing to indiscriminate drugging. All healing power is inherent in the human system, and if physiological laws are obeyed, much sickness would be prevented. Physicians may restore health by restoring the supremacy of the laws of nature, but if they are ignorant of these laws, the more will they fill the body with drugs, and flatter themselves that they are curing disease.

Superstition is, and always has been, a stumbling block in the path of human progress, and the delusions and crimes resulting therefrom would fill volumes. It is doubtful if any explanation of natural laws will ever succeed in entirely eradicating the firmly-founded faith in superstition. As we near the close of the nineteenth century, we find that fads have greatly multiplied. Old and out-worn superstitions are revived again. The so-called "Christian Science," mind cure, faith cure, spiritism, astrology, and many other whims of a "stimulated body and an unanchored mind."

Because we fail to understand a thing, it does not necessarily involve the inability of natural law to account for it. And to say that a phenomena is *super*-natural, is simply to say that we are too ignorant or too dishonest to give it the study and investigation which alone can account for, and alone have explained all known phenomena. Telepathy, clairvoyance, and the phenomena of modern spiritualism are simply natural processes, going on under a natural law of which, as yet, we know but little, but undoubtedly which, by experiment, study, and thought, we shall get at in time. In all ages of the world, telepathy, clairvoyance and hypnotism, have been known under different names; and the belief in an unknown and invisible world, inhabited by spirits who at times can make their presence known, is a form of belief deeply rooted in man's nature, and spread over all time. This belief is coeval with history, with mythology, with folk-lore, with religion. President Jordan says: "The phenomena of hysteria, faith-cure, openness to suggestion, subjective imagery, mysticism, are not indications of spiritual strength, but of decay and disintegration of the nerves. The ecstacy of unbalanced religious excitement and a stupor of a drunken debauch, may belong to the same category of mental phenomena. Both point to a moral and spiritual decay." There are clouds of myths surrounding the cherished beliefs of millions, yet back of all are primary truths, which are coming more and more to the light. Myths are but shadows of the real, and a shadow cannot be without a substance. We often find a great mass of apparent superstitions and absurdities heaped upon a grain of something that may be true.

Man everywhere in his barbarous state is a believer in sorcery, witchcraft, enchantments; he is fascinated with the incomprehensible. But it is not only among savages that we find credulity and superstition. As we have said, the love of the marvelous is characteristic of every age of the world, because man knew nothing about the forces of nature, and laws of which he was quite ignorant of, and he was very apt to interpret them, more or less clearly, as the work of some being of like passions with himself, but vastly more powerful, whom it was his interest to propitiate. The history of the ancient world, and also that of the middle ages, is scarcely more than a history of witchcraft and magic. The Egyptians and Assyrians had their magic, the Greeks and Romans their oracles, the Hebrews their seers and prophets; and every great religion, the Christian, Roman, Grecian, Mohammedan, Buddhistic, and Zoroastrian, had its inspired teachers, and every savage nation its medicine-men. The whole Christian world during the sixteenth, seventeenth and eighteenth centuries was thoroughly imbued with the belief in witchcraft, and probably more suffering and agony have been caused by this belief than by all the wars of ambition that have ever cursed the earth. What men did not know they imagined, and the lingering folly of imbecile minds is too prevalent at the present day. The people in former days did the best they could with their knowledge. But in this supposedly enlightened age we are supposed to know better. Error, however, scarcely ceases under one form before it is reproduced in another, so unable is reason and experience to combat with the passionate desire to penetrate into futurity.

Says M. Berthelot, "The word mystery and miracle are alike excluded from scientific language and methods, not by virtue of purely logical deductions, but because wherever it has been possible to take deep soundings of phenomena, we have found that they were constantly produced in accordance with a determined relation between effects and causes." The foundations of science are in the truth of things, and it has all truth for its domain. Science ignores no fact, and it does not build superstructures on wrong premises. Science has shown us that the laws of nature, being founded on pure reason, are absolutely unchangeable. Although everything is in constant motion every moment, yet every law, like the law of gravitation, never varies for a moment, and is never for an instant suspended. The smallest atom that floats in the sunbeam and the minutest molecule is bound as a part of the mysterious whole in the inextricable harmony with the laws by which planets move in their appointed orbits. The development of every organism from a primordial cell to its final condition, however elevated that condition may be, is the inevitable consequence of the operation of a universal, invariable, and eternal law. Every phenomena of nature, whether it be the transit of Venus, the structure of a spider's web, the conduct of a crystal in assuming a definite arrangement of the particles in lines, angles, and laws of accretion, or the first instinctive movements of an infant's lips seeking its mother's breast—all follow an immutable and unchangeable law. As everything in this world is governed by law, it is very important that all the various phenomena known as spiritualism, thought transference, clairvoyance, the action of mind upon matter, and other phenomena, which has been known for thousands of years, but never properly investigated, should be investigated in a scientific spirit, and the laws which govern their occurrence formulated. This to a certain extent is being done by the Society of Psychical Research, which is composed of men prominent in all the professions, men of genuine scientific ability and integrity, who are able to approach the subjects under consideration without preposession or prejudice, favorable or unfavorable, "but with a single-minded desire to bring within the realms of orderly and accepted knowledge which appears as a chaos of individual beliefs." Investigations during the past year made by the London Society of Psychical Research, have proved beyond the shadow of a doubt the theory of sublimal self, or another personality that exhibits functions and powers far exceeding the functions and powers of the ordinary self, and forming no part of any recognized system of mental action. Clairvoyance and hypnotism have given us a key to that mysterious and mythical region of the human soul, and we are beginning to get hold of facts and laws that have been a mystery for ages.

The ascent of man from darkness to light, from his origin, his development, to his present condition, has been long and slow, and often fierce and pitiless, but we believe that the little fragment of the universe upon which we appear and disappear, is a nursery for something greater, if only man can be brought into harmony with the laws of the universe. Men and women cling to the illusions of life because they do not know what life is. Mr. W. H. Mallock wrote, "Human life is a thing of importance; it is of the utmost matter how we live it. Lived in one way, it is a hateful failure; lived in another, it is a beautiful success."

Thousands upon thousands of people drift along with the tide, with no ambition except to get enough to eat and drink, or fired with an unwise ambition to get money, while their brain, the most important organ in the body lies fallow.

Life is valued solely for what it offers for the enjoyment of the material nature of man. The shores of modern times are becoming strewn with nervous wrecks kept at a high tension, in the mad strife for wealth and social position.

The greatest amount of ignorance is shown in the simple habit of eating. Into the most delicate organ of the body, people crowd meat, vegetables, pastry, confectionery, nuts, fruit, wines, ice-water, etc., and habitual gormandizing fills the blood with half-digested food, which lodges in tissues and organs, and disease is the result. Sooner or later those organs must break down, and the whole system becomes a wreck. Most diseases of advanced life are due to interruptions in the processes of waste and repair. When the poisonous waste material of the body has not been properly eliminated, and is retained in the system, and reabsorbed and deposited in the joints and various organs, innumerable ills are the consequence. If one grain a day of poisonous matter is retained, it would amount to nearly an ounce in a year, and a very few years are sufficient to produce serious results, such as ossification of the arteries, apoplexy, Bright's disease, gout, rheumatism, cancers and tumors, and various diseases too numerous to mention. Herbert Spencer says, "Disease is the result of a violated law, a wrong done to Nature, and whether we are responsible for it or not, the fact remains still potent for our consideration of the greatest of all problems, that the sick man is a sinner against Nature, and that he will have to pay the penalty to the last farthing, both for his own and his ancestors' misconduct."

The influence of diet over the character, disposition, and morals of a people, both nationally and individually, is a doctrine that has received the countenance and support of some of the greatest names in science. We doubt if a person can attain to a high spiritual development, if his principle diet is the corpses of animals. A love for the pleasures of the table and a predominating epicurian inclination, is often the indication of incapability. The term "heaven" means a state of spiritual consciousness and enjoyment of spiritual truths. But how can a man who has been a gormandizer, who has stupefied his brain with liquors, who has weakened his heart and digestion by the use of tobacco, who has led a mean and sordid life, who has no spirituality, and, although he has been a steady church-goer, how can he enjoy that which he has never perceived?

And what shall we say of the very prevalent habit, which, owing to the lack of moral and spiritual consciousness of Christian people, has spoiled the lives of more women, ruined more hopes for them, brought more shame and hardship than any other evil that lives. Careful estimates reveal the apalling fact that seven hundred millions of dollars are required to supply the destitution and punish the crimes—the direct outcome of the use of intoxicating liquors in the United States. As a writer says, "The amount of sorrow and shame, of agony and despair, of vicious and degrading examples, of crime and brutality existing in wretched hovels and in more pretentious dwellings, all caused by alcohol, is known only to God himself." It seems incomprehensible that civilized nations will suffer an evil in their midst, that fills their jails, hospitals, lunatic asylums, and graveyards. The usual advance of the nervous symptoms observed in successive generations of drinking men, is as follows: In the first generation, depravity and drunkenness; in the second, drunkenness, mania, and generally paralysis; in the third, hypochondriasis and melancholia; and in the fourth, imbecility and idiotism, resulting, probably, in the extinction of the race. The vices and diseases of our ancestors are reproduced in ourselves, and their good deeds and lofty sentiments; and we again transmit them to our offspring. We have the power of rendering happy or miserable those who follow us, and making the general state of society better or worse. If we could select our grandfathers and grandmothers, we could largely reduce the number of our physical ills. Whatever has a tendency to lower the physical, intellectual, or moral tone of the parent, has a tendency to exert a disastrous influence over the future well-being of the child. But the study of man and the improvement of the human race, has remained enshrouded in Egyptian darkness, while a great amount of work is being done, and millions spent in order to improve the breed of cattle. Expert horticulturists perfect plants by the careful selection of seeds, so that marvelously beautiful flowers are at length evolved from carefully improving growths.

What is the lesson to be learned? It is the duty of all thinking men to assist in lifting the race up to higher outlooks and nobler ideals of life and conduct. To become perfect, physical health, intellectual growth, and spiritual perception and activity, should go hand in hand. To be spiritual is to know the spirit of everything, to perceive the divine law and nature of all the facts with which our daily life confronts us, and of as many other facts in as many other provinces as we have the ambition and ability to perceive. Every man and woman can feel within their souls the divine Spirit, when they can perceive and enjoy spiritual consciousness. No matter how devout worshippers they may be, they must have the divine Spirit awakened in their soul, or they continually walk in darkness. Mere belief, however, is a confession of ignorance; true faith is based on conviction. It is our own selfish thoughts and desires that prevent us from seeing the light of the truth. Only when the divine Spirit in man is awakened to consciousness and knowledge, will man be able to reach the ideal. Some one has said that some men try to become too spiritual, by neglecting the duties of life, and not appreciating the beautiful world in which we live, and that they are incessantly mounting the soul's garret stairs to keep the skylight unfastened, as if God was determined to get in that way alone. If a person could forget his own personality and try to live in others, by blending his consciousness with that of some others, then would he be willing to receive Christ within him, and all the low and petty things which make for some a life of torment, such as greed, avarice, envy, jealousy, fear, doubt and sorrow, pain and suffering, would then take their departure. It is easier for the majority of mankind, ignorant of correct methods of thought, to follow the traditions and the teachings of past generations, than independently to investigate and judge their truth and propriety. The practical gospel of the age, testified everywhere by faith and works, is that of money-getting. To get rich men sell their souls. False standards are set before the youth of the land. The are taught that nothing succeeds like success. Men are mainly estimated by the amount of their wealth, and take social rank accordingly. Happiness is sought through the sense of taste. The continued absorption of the mind in making aquisitions generates a littleness of mind. To them there is no desirable thing in this world but gold, luxury, and ease. The result is that the offspring often results in degeneracy, mental and physical. Said Jesus, "Beware of the Scribes, which desire to walk in long robes, and love greetings in the market-places, and the highest seats in the synagogue, and the chief rooms at the feasts, which devour widows' houses, and for a show make long prayers; the same shall receive greater damnation."

Very few people realize what a wonderful little world, what a fairy land of exquisite beauty they live in, and the infinite beauty which Nature sheds every day over this fair world is unappreciated. The microscope reveals to our view a most beautiful and myriad-peopled world of life, which it would take the lifetime of a man to explore. The telescope, spectroscope and camera, bring to our view another beautiful world, which the mind of man cannot fathom. But without the microscope and the telescope, God sends to us thousands of graceful organic forms, which are scattered in profusion over the surface of the earth. Theodore Parker, one of the greatest minds this country has produced, said, "that there is a delight in feasting on the beauties of earth, the garment in which God veils the brightness of his face; in being filled with the fragrant loveliness of flowers; the song of birds; the hum of bees; the sounds of ocean; the rustle of the summer wind, heard at evening in the pine tops; in the cool running brook; in the majestic sweep of undulating hills; the grandeur of untamed forests; the majesty of the mountains; in the morning's virgin beauty; in the material grace of evening, and the sublime and mystic pomp of night, Nature's silent symphony—how beautiful it is."

The universe is filled with harmony, and a soul who is in full harmony with the soul of the universe, may "listen to the music of the spheres" understandingly. If the strings are in perfect order no discords will be sounded. If the principle of harmony exists within ourselves we may recognize it in the music, and it becomes alive to our soul. Says Carlyle, "See deep enough, and you see musically, the heart of Nature being everywhere music, if you can only reach it." There are harmonies in optics as well as in acoustics, and a group of harmonies is melody both in music and color. Says a writer, the scale of color is red, orange, yellow, green, blue, indigo, and violet. If one will notice the sunset sky, he will find that the western skies ever chant their evening hymn on the 5th, 7th and 2d of the ethereal music.

There is not a plant that blossoms, a gem that sparkles, or a bird that sings, but that manifests God's creation; the varied hum of the insect creation, the summer mantle of vegetation and the winter robe of snow, all testify to the beauty of this world, but it is only to those whose spiritual eyes are opened that the full glories of creation are revealed. All we can know of God, the heart, the life, the soul of this infinite universe, is only one aspect of His work, and the rest is cut off and covered by our human limitations. But we know His presence, for "He trails his garments among the sunlit clouds, the stars of the deep blue are the jewels of His coronet, the sweetness of His presence is among the roses and lilies, the murmuring of waters is the music of His voice, and on Him can we rest in perfect confidence, in that hour when this outer world is melting away from us like the morning mists in the presence of the sunlight."

If man is so constituted as to appreciate the wonderful world in which he lives, to raise himself above the trivialities of life, and to use to a good purpose the brain that has been given him, life will be longer, broader, grander, pleasanter, more useful, and have a richer color, a deeper meaning, and his will be a spirit inspired by a love of the excellency and beauty of knowledge.

A Note on the Esquimauan Language.

BY HUGH J. LEE,
Of the Peary Expedition, 1893-'97.

Although it is very hard to learn the Esquimauan language perfectly, it is comparatively easy to pick up enough of it to make one's wants understood, or even to carry on a limited conversation.

This language is spoken by the inhabitants of over 10,000 miles of coast line, or by the people living in all the most northern portions of the inhabited globe.

There are at least eight different tribes who have different dialects, but the people of one can easily understand each other; as, for instance, in England the people of the different sections have different ways of expressing themselves.

The eight separate tribes dwell on the east coast of Greenland; on the west coast of Greenland, south of Melville Bay; on the west coast of Greenland, north of Cape York; on the west shore of Baffin's Bay, north of Cape Walsingham; on the shores of Cumberland Sound; on the shores of Hudson Bay and Strait; on the Labrador coast and on the Alaskan coast.

Personally I have spoken to the natives of five of the different tribes, and can make myself understood by the people from each of them. It is true the clothing is different and some of their habits are not the same, but the one language is prevalent throughout the whole north region.

Although their physiognomy is decidedly Mongolian, yet their language is not monosyllabic like the Chinese, but distinctly agglutinative like all the Indian languages of North America, being composed of long compound words and regular inflections. The root or principal syllable remains unchanged.

With the Ural-Altaic languages, the Esquimauan has certain morphological features in common. Thus they all, after a method of their own, suffix the possessive pronoun to the noun. These also resemble one another in their syntax. Like the Ural-Altaic, the Esquimauan employs suffixes only for the definition of a meaning, but it is also capable of forming a complex sentence in a single word.

Many attempts have been made to classify the Esquimauan with other better known groups, but they have not met with much success. They even seem to differ from each other in the most decided manner, but we know from their structure they belong, all of them, to the agglutinating class. The chief difficulty in learning the language is the habit of combining many words to form one complete meaning. Adjectives, participles, usually pronouns, prepositions and particles of augmentative and diminutive signification, are tacked on at the end.

There has been found a relationship between the Esquimauan language and a dialect or two in the extreme northeast of Asia, but it is extremely probable that the communication there has been from America to Asia. The natives on the coast of Behring's Sea, north of Kamschatka, appear to be related to the Esquimau of the northern shore of our continent, and thus would seem to be emigrants out of America into Asia.

The following vocabulary was written for Mrs. Lee by Herr. Inspector Andersen, the chief magistrate of the northern part of the Danish possessions in Greenland:

1	Adasa	7	Arfini Mardluk
2	Mardluk	8	Arfini Pingasut
3	Pingasut	9	Krulalucet
4	Sissamat	10	Krulit
5	Detlemaet	11	Isikani
6	Arfinitlit	12	Isikani Mardluk

Summer	Uperna	Moon	Kramat
Winter or Year	Ukiok	Land	Nuna
Month	Krama	Water	Immerk
Day	Utlok	Island	Krekertak
Evening	Unuk	Wind	Anore
Morning	Utlak	Rain	Sialuk
To-day	Utlumi	Snow	Aput
Yesterday	Itbasak	Ice	Siccu
The day before yesterday	Itbasane	Foggy	Bujok
To-morrow	Akrangu	Cold	Issi
Long time ago	Itsak	Warm	Kijek
Sky	Krilak	Weather	Silla
Sun	Sekrinerk		

Bear	Nanok
Hare	Ukalerk
Dog	Krimerk, *plu.* Krimi
Whale	Arfak
Dolphin	Nisak
Fox	Terioengilak
Seal	Puissi
Raven	Tuluak
Ptarmigan	Akoisit
Gull	Naja
Auk	Agpoet
Little Auk	Serfoet
Eider Duck	Mitek
Eggs	Manit
Codfish	Ovak, *plu.* Ovot
Salmon	Erkraluk
Wood	Krisuk
Tree	Orpik
Plants	Navssut
Berries	Farnak
Grass	Ivik

Greenlander	Inuk, *plu.* Inuit
Danish man	Kablunak
Englishman	Duluit
Man	Angut
Wife	Arnak nullia
Young girl	Neviarsiak
Child	Mirak
Son	Ernek
Daughter	Benja
Head	Niakornak
Arm	Dalerk
Leg	Nio
Stomach	Nassat
Habit or Robe	Kavajak
Trousers, for Men	Radlik
Trousers, for Women	Dagisut
Hat	Nessak

Food or Meat	Nerissassa
Brandy	Sileranglitok
Bread	Linsinssaet
Butter	Bunerk
Fat	Kralunark
Beef	Nerkri
Flour	Pannekagsiak
Potatoes	Issiosaet
Milk, also Cheese	Imok
Salt	Darajut
House	Igdlu
He is in his house	Igdlomepok
Window	Ingala
Door	Mado
Table	Nercoivi
Chair	Isiavik
Bed	Sinifik
Fork	Ajagssatit
Knife	Savik
Lamp	Rudlerk
Cork	Simerk
Corkscrew	Simersit
Spoon	Alugssat
Glass for watet	Imertorfik
Key	Madursak
Carpet	Uligssak
Servant	Kifak

Boat, in general	Umiak
Boat	Omiada
Ship vessel	Omiarsuit
Steamer	Omiarsuit bujortut
Captain	Nalagak omiarsuit
Crew	Kifak omiarsuit
Stream	Sarfak
Sea (high)	Malik
North wind	Avanak
East wind	Asarnak
Southwest wind	Kiarnak
West wind	Kanangnak

I	Uanga	Yes	Ap
You	Idlit	And	Ama
Who	Kina	As	Sordlu
What	Suna	There (if you please)	Ak
What is?	Sunana	There it is	Ajona
What do you say?	Kanok	It is sure	Illumut
Where	Nork	I do not know	Asukiak
This	Una	I do not understand	Nelluera
Here	Mane	Thank you	Kujanak
There	Tassane	Thank you very much,	Kujanaksoak
Now	Massagut	Wait (an instant)	Oatik
But	Kisienne	Farewell	Inutluarit
Alone	Kissimik	Good-night, sleep well	Sinutluarit
No	Maka—Nakali	Come	Kra—Kranierit
Not, Nothing	Namik—Namerdlu	Fast	Asut
Not yet	Suli namik		

It is good	Ajungilak	White	Karkartot
It is not good	Ajungningilak	Red	Abelartok
It is difficult	Subernakrak	Great, High	Angisorsoak
It is not difficult	Subernangilak	Little	Mekisungoak
It is bad	Ajorpak—Ajornakrak	Very little	Mekisorulanguak or Unmanuak
Is it bad?	Ajorpa		
He is dead	Tukuvok	New	Nudak
Anxious	Ersivok	Seek to be	Naparsimavok
He comes	Tikipok	To work	Sanavak, Sulivak
Does he come?	Tikipa	To see	Isingivok
He does not come	Tigingilak	To hear	Dosavok
It is finished	Enerbut	To say	Orarpok
Is it finished?	Enerpa	I come	Tikipunga
He starts to go away	Atlarpok	You come	Tikiputit
It is enough	Namerpok	He or she comes	Tikipok
Angry	Kamak	We come	Tikipugut
Nice, fine	Benerkra—Pidava	You come	Tikipusi
Old	Utorkrak	They come	Tikiput

Shop, Store	Pisiniarfik	Money	Aningassat
He buys	Pisiniarpok	Have you money?	Aningassat krarbit
Does he buy?	Pisiniarpa		
The Governor	Nivirtok	How many?	Kravsit
Not yet	Suli namik	I have no money	Aningassat Barangilak

The following principal tribes and villages of the Esquimaus, as collected by Major Powell, is given here as an illustration of the spelling of proper names:

GREENLAND GROUP—EAST GREENLAND VILLAGES.

Akorninak.
Aluik.
Anarnitsok.
Angmagsalik.
Igdloinarsuk.
Ivimiut.
Kemisak.
Kikkertarsoak.
Kinarbik.
Maneetsuk.
Narsuk.
Okkiosorbik.
Sermiligak.
Sermilik.
Taterat.
Umanak.
Umerik.

WEST COAST VILLAGES.

Akbat.
Karsuit.
Tessuisak.

LABRADOR GROUP.

Itivimiut.
Kiguaqtagmiut.
Suduinimiut.
Taqagmiut.

MIDDLE GROUP.

Aggomiut.
Ahaknanelet.
Aivillirmiut.
Akudliarmiut.
Akudnirmiut.
Amitormiut.
Iglulingmiut.
Kangormiut.
Kinnepatu.
Kramalit.
Naguektormiut.
Netchillirmiut.
Nugumiut.
Okomiut.
Pilingmiut.
Sagdlirmiut.
Sikosuilarmiut.
Sinimiut.
Ugjulirmiut.
Ukusiksalingmiut.

ALASKA GROUP.

Chiglit.
Chugachigmiut.
Ikogmiut.
Imahklimiut.
Inguhklimiut.
Kaialigmiut.
Kangmaligmiut.
Kaviagmiut.
Kittegareut.
Kopagmiut.
Kuagmiut.
Kuskwomiut.
Magemiut.
Mahlemiut.
Nunatogmiut.
Nunivagmiut.
Nushagagmiut.
Nuwungmiut.
Oglemiut.
Selawigmiut.
Shiwokugmiut.
Ukivokgmiut.
Unaligmiut.

ALEUTIAN GROUP.

Atka.
Unalashka.

ASIATIC GROUP.

Yuit.

The Beginnings of Life.

Our ignorance of details prevents us from solving many difficulties, and even from presenting a complete and harmonious theory of the origin of self-conscious life. But it is a fact beyond dispute that every human being commences his individual existence as a tiny piece of protoplasm, a single cell with a nucleus and neucleolus. From this original cell, by growth and development, the body, with its various tissues is built up. From man himself down to the lowest fungus and algæ, every organism begins as a minute spheroidal mass of protoplasm, and this minute particle of protoplasm, a particle of structureless semi-fluid, glue-like matter, may grow up into a tree, a fly, a fungus, a flowering plant, a fish, an earthworm, or an ape, all on the same general plan of cell formation, and the adjustment of internal conditions to conditions which are external.

Each cell has a life of its own. It manifests its vital properties in that it is born, grows, multiplies, decays, and at last dies. During its life it assimilates food, works, rests, and is capable of spontaneous motion and frequently of locomotion. The cell can secrete and excrete substance, and, in brief, presents nearly all the phenomena of a human being. The construction of these tens of thousands of chemically different cells, made of the same elements, to make up the various kinds of vegetable and animal organism, and in each organism the different parts, is the fundamental mystery of organic life, for which none of the known forces of nature give us the least account.

If we examine the brain with a microscope, we find it composed of myriads of cells, as infinite in number as the stars are in the firmament, of almost every conceivable shape, and connected with each other by minute nerve filaments. It is by reason of the infinite number of these cells that the notions of thought and perception go on and impress the material world without, and are in turn being impressed by it.

By the action of a law, as yet imperfectly understood, every act of our lives is certainly but surely registered within the marvelous structure of our bodies. No external influence or internal processes can ever change the hereditary nature of the germ-plasm, the blastema of the primitive egg, which is inherent in every man, and has been since man started on his immortal career, millions of years ago.

The infinite variety of man's psychical life, his sensations, his emotions, his conscious and unconscious movements, and his thoughts all owe their existence to millions of microscopical nerve cells, which are all built upon the same fundamental plan. It is possible to trace, step by step, the evolution of the nerve-system, in the animal series, and the parallel evolution of psychical faculties.

After all our microscopical research, we are still in ignorance of the structural constitution of a cell. If the principle of cell life is finally discovered, man will know how to "keep life alive," by reinforcing it with new life, just as a declining fire is reinforced with new fuel. To discover how the life principle of the cell may be fed and renewed, is one-half the problem of making men live indefinitely. We know that the vital processes are attended by chemical changes, but the method and mechanism by which the changes are wrought are not yet known. There is no doubt but that man follows nature's ways in this work. In animals and plants the primordial germ is in every instance the same, and in the first stages of its career it is in all instances identical, so that for a period of time no indication is presented us to which of the two kingdoms, animal or vegetable, it is to belong, for every plant, every animal, of course every human being corporeally, is but a less or larger, simpler or more complex developed, or amplified and differentiated organic cell. The most experienced eye, with the assistance of every means of scientific analysis, is not able to recognize in a germ the animal into which it is going to develop, whether fish, bird, insect, animal, ox, or man. And not only this, but man in his evolution from the primordial cell, as far as the nervous system is concerned, presents the successive characteristics of an avertebrated animal, a fish, a turtle, a bird, a quadruped, a quadruminous animal, before it assumes the special human characteristics. The germ of each species possess an inherent and innate faculty, a specific energy, which directs its development in a manner characteristic of its progenitor and of no other.

Life ranges through the whole field of matter, and all organisms, vegetable and animal ones, grow by the action of internal forces acting outwardly, and not by having something added to their substance from the outside. If it were not for the selective care of the cells which compose the human body, every article of food we eat would be as dangerous as dynamite.

C. H. S. D.

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